P-003

Police Modifier Bulletin

SVE BULLETIN

SPECIAL VEHICLE ENGINEERING – BODY BUILDERS ADVISORY SERVICE

E-Mail via website: www.fleet.ford.com/truckbbas (click "Contact Us")

Toll-free: (877) 840-4338

Date: 3 April, 2012

2013 Sedan & Utility Police Interceptors Vinyl Wrap Application & Care

Models Affected

2013 Sedan & Utility Police Interceptor applications beginning Job #1 2013MY that have a vinyl wrap applied to the vehicle body.

Purpose

This bulletin provides direction on application and caring for vinyl wrap applied to the vehicle body.

Vinyl Wrap Application

WARNING: Before beginning any service procedure in this section, REFER to Safety Warnings included in the attached documents, on materials/chemical containers/instructions, and with tools used. Failure to follow this instruction may result in serious personal injury.

Ensure Safety Warnings for all interfacing components/systems encountered or possibly affected are reviewed.

3M Special Applications and Vehicles

Instruction Bulletin 5.4

Release J, Effective June 2009
See Bulletin Change Summary and end of Bulletin

Special Applications and Vehicles

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How to Use This Bulletin Effectively

The techniques described in this Bulletin are required when applying a 3M warranted graphic, but are also practical recommendations when using promotional materials for non-warranted graphics. Applying a graphic is more than just adhering the film to the substrate. Be sure you read and follow the instructions in all Bulletins referenced in the sections you are using.

Instruction Bulletin	Description
5.4 (this one)	General application of film. See Table of Contents.
5.1	Application, Substrate Selection, Preparation and Substrate-specific Application Technique
5.5	General Procedures for Interior and Exterior Dry Applications
5.36	Application Techniques for Automobiles, Vans and Buses
5.37	A Guide to Understanding and Applying Graphics to Common Smooth and Textured Wall Surfaces
5.42	Application: Special Considerations for Watercraft
5.44	Application and Maintenance of Petroleum Pump Graphics
5.45	Application Techniques for Railcars

3M Special Applications and Vehicles – (continued)

Health and Safety

⚠ CAUTION

When handling any chemical products, read the manufacturers' container labels and the Material Safety Data Sheets (MSDS) for important health, safety and environmental information. To obtain MSDS sheets for 3M products go to 3M.com/MSDS, or by mail or in case of an emergency, call 1-800-364-3577 or 1-651-737-6501.

When using any equipment, always follow the manufacturers' instructions for safe operation.

⚠ CAUTION

Any activity performed for a long period of time in an awkward position or with a high amount of force is potentially a risk for causing musculoskeletal strain, pain or injury. When applying graphics, follow these practices to improve comfort and avoid injury:

- Alternative your tasks during the application.
- Schedule regular breaks.
- Perform stretches or do exercises to improve circulation.
- Avoid awkward reaching.

Air Quality Regulations

State Volatile Organic Compound (VOC) regulations may prohibit the use of certain cleaning chemicals with VOC's in graphic arts coatings and printing operations. For example, the California South Coast Air Quality Management District prohibits use of certain solvent-based solutions without a permit and other California AQMD's prohibit use of certain solutions without a permit or a regulatory exemption. Check with your State environmental authorities to determine whether use of this solution may be restricted or prohibited.

Understanding Adhesive Characteristics

Non-Reflective Films with Pressure-Activated Adhesive

Pressure-activated adhesive (PA) is available only on 3M™ Controltac™ Graphic Films, which is available in versions with or without Comply™ Adhesive.

Pressure-activated adhesive allows the film to slide easily on the substrate, be positioned with light finger pressure, and repositioned if it is not in the right place. However, so that a good adhesive bond is established, the positionability feature is lost when:

- Firm pressure with a squeegee or other application tool is applied.
- Application temperatures are above 100°F (38°C), even if only light finger pressure was used for tacking.
- If any part of the film is removed from the original liner and reapplied to the same or another liner.

Reflective Films with Pressure-Activated Adhesive

Some 3M™ Scotchlite™ Reflective Graphic Films have a pressure-activated adhesive that allows the film to slide easily on the substrate. Pressure applied by hand, squeegee or application tool immediately bonds the film to the substrate and the slideability feature is lost. Reflective film cannot be lifted and repositioned without damage.

Films with Pressure-Sensitive Adhesive

Some 3M™, Scotchcal™ and Scotchlite™ Graphic Films have pressure-sensitive adhesive (PSA), which bonds to the surface even with light pressure and cannot be repositioned.

Film with Comply™ Adhesive

Selected 3M graphic films have air release channels, a characteristic of Comply adhesive. This feature may be found in films with either pressure-activated or pressure-sensitive adhesive that is permanent, changeable or removable.

Comply adhesive is a versatile technology with multiple versions. The original Comply adhesive has a slightly visible pattern on the film surface. A designation like "Cv2" or "Cv3" (e.g. 180Cv2-10 or IJ380Cv3) indicates a different Comply pattern. In these two cases, the pattern is virtually invisible, and the Cv3 version features improved air bleed. Refer to the specific film's applicable Product Bulletin for details.

Continued on the next page.

3M Special Applications and Vehicles – (continued)

Removing and attempting to change a film liner or reapplying the same liner damages air release channels.

When applying graphics, always work from the center out to the edges of the graphic to allow trapped air to exit through the air release channels. If the channels are closed off by firm pressure and air is trapped, use an air release tool to aid in removing air bubbles.

Permanent, Removable or Changeable

3M offers films with permanent, removable or changeable adhesive, which may be combined with other adhesive characteristics described above.

Important Note!

The type of application surface and its texture influences the following descriptions. Be sure to check the Product Bulletin for the film you are using for complete details.

Permanent adhesive means the film is not intended for removal at any time. Heat, chemicals, tools and effort may allow you to remove the film, but damage to the substrate is likely.

Removable adhesive means the film may be removed from an approved substrate within the stated warranty period and leaves 30% or less adhesive residue. Some removable films require heat and/or chemicals for successful removal. In some cases, the film may break into small pieces as it is removed, and substrate damage may occur.

Changeable adhesive means the film may be removed from an approved substrate within the stated warranty period without heat or chemicals and leaves little or no adhesive residue. This adhesive characteristic is available only in short-term films.

Application Tools

- Scotch® Masking Tape, 2 inch wide
- 3M™ Plastic Applicator PA-1 (Blue or Gold*)
  - The gold applicator is most generally used. It is stiffer than the blue applicator, which allows maximum application pressure.
  - The blue applicator is used when you need more flexibility. It is softer, which allows you to mold it around contours and corrugations.
- 3M™ Low Friction Sleeve SA-1*
- 3M™ Rivet Brush RBA-1 or RBA-3*
- Pin or 3M™ Air Release Tool 391X*
- 3M™ Primer 94
- 3M™ Edge Sealer * (Use the one recommended in the Product Bulletin)
- Cutting tools, such as a razor blade with a safety holder
- Industrial heat gun; must be capable of attaining 500° to 750°F (260° to 399°C), or equivalent
- Cotton gloves
- A 1/4 inch (0.6 mm) paint brush for applying edge sealer

*Available from 3M Commercial Graphics Division

Temperature and Environment

Apply graphics when the air, film and substrate temperatures are within the range specified in each film's Product Bulletin. If the temperature range of various components in your construction varies, use the most conservative values. The incorrect temperature may prevent the graphic from performing as expected.

Conditions that Affect Graphic Application

- Graphics applied above the maximum recommended application temperature may pre-adhere.
- Above the maximum recommended application temperature, graphics constructed of Controltac films may lose their positionability feature.
- The temperature of the substrate must be above the dew point to prevent moisture from condensing on the surface.
- In very humid conditions, it may be difficult to keep the substrate dry.

Continued on the next page.

3M Special Applications and Vehicles – (continued)

- Below the minimum recommended application temperatures, film becomes stiff and brittle. The adhesive cannot bond adequately with the substrate.
- Substrates may be heated in order to raise the surface temperature above the minimum specified. Use an appropriate portable heater or heat lamps. Always check to ensure that heat will not damage the substrate.

Substrate Preparation

See Instruction Bulletin 5.1 for details on cleaning specific substrates and any special application techniques that are required.

- All substrates must be considered contaminated and must be cleaned prior to application of film or sheeting.
- If the substrate has dirt or loose paint on it, that is what the film adheres to--not the substrate itself. If the film does not make enough contact with a clean, dry substrate, it will not stick well, leading to premature graphic failure.
- Perform the final substrate cleaning step immediately before applying film. Dust and other contaminants can collect quickly on the substrate and prevent the film from adhering properly.
- Be sure the substrate, rivets and seams are thoroughly dry. Film adheres poorly even to a properly cleaned substrate if there is any moisture around the rivets and seams.

Application Sequence

Unless otherwise noted, follow the General Procedures in Instruction Bulletin 5.5.

Shelf Life, Storage and Shipping

Shelf Life

Total shelf life: 2 years from the date on the original box
Up to 2 years unprocessed, ***OR*** process within 1 year ***and*** apply within 1 year of processing

Storage Conditions

- 40° to 100°F (4° to 38°C) *Typical value; check your film's Product Bulletin for details.*
- Out of sunlight
- Clean dry area
- Original container
- Bring the film to print room temperature before using

Shipping Finished Graphics

Flat, or rolled with printed side out on 5 inch (13 cm) [6 inch/15 cm for reflective films] or larger core. This helps prevent the liner and application tape, if used, from popping off. *Typical value; check your film's Product Bulletin for details.*

Special Applications

Complex Curves and Contours

Covering complex curves and contours requires special techniques, including heating and stretching the film. Films and sometimes the inks with which they are printed, have differing abilities to stretch, so the amount of heat and tension depends on the graphic construction. The specific characteristics of a film and an ink, as well as whether the shape is concave or convex, determines how well the film holds to the curved substrate.

Before deciding to heat and stretch film, check your panel placement to determine if it can be applied simply using the techniques for corrugations. See page 8. Also check the Product Bulletin for the ink you are using.

Which Films Can Be Stretched

Easiest to Hardest

Graphics made with the following constructions are rated below from easiest (1) to hardest (4) to stretch:

1. 2 mil vinyl
2. 2 mil vinyl with an overlaminate
3. 4 mil vinyl
4. 4 mil vinyl with an overlaminate

3M Special Applications and Vehicles – (continued)

Cannot be Stretched

Graphics made with the following constructions cannot be stretched, and, therefore, are not warranted for use on complex curves and contours surfaces:

- Film with polyolefin as a base film or overlaminate
- Reflective graphic film (stretching damages the reflectivity)
- Polyester base film or overlaminate

Planning the Application

Panel Placement

Lay out the graphics to determine the panel placement. If stretching is needed, be sure to follow the instructions that follow.

Overlapping Panels

When applying multiple, overlapping panels, be sure the overlaps cannot trap and collect moisture. On a vehicle, be sure the overlaps face away from the air flow.

- Vertical overlap (vehicles only): start at the back of the vehicle, and then work around toward the front.
- Horizontal overlap: start at the bottom of the substrate and work up.

Temperature

For ease of application, apply the film at room temperature or above, but not higher than the maximum recommended application temperature. Refer to the film's Product Bulletin.

⚠ CAUTION

Heat or open flames may contribute to a flash fire or burns. Follow these precautions when using a heat source for flame treating.

- Read and follow the instructions supplied with the heat source.
- Avoid personal contact with the heat source. Wear heat-resistant gloves and safety glasses.
- Do not use heat sources near solvent mixtures or residues, or where solvent vapors may be present.

⚠ CAUTION

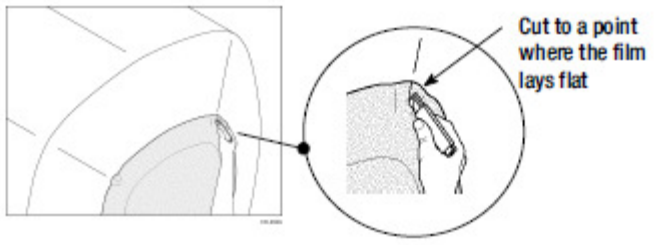
Always provide adequate ventilation to remove emissions that result from the heat of flame treating. Failure to provide adequate ventilation can result in operator exposure.

Convex Contours

Depending on the severity the curve, the film may bunch or ruffle and then wrinkle at edges.

1. Clean the substrate thoroughly using detergent and water followed by a solvent wipe.
2. Apply the graphic to the largest flat area first, then to other large flat areas.
3. For light bunching or ruffling, try using gentle heat to shrink the edges of the film slightly before squeegeeing.
4. To eliminate heavier bunching or ruffling, cut to where the film lays flat. See FIGURE 1.

FIGURE 1
Cutting Excess Film
Illustration shows convex surface such as on the rear of a tanker

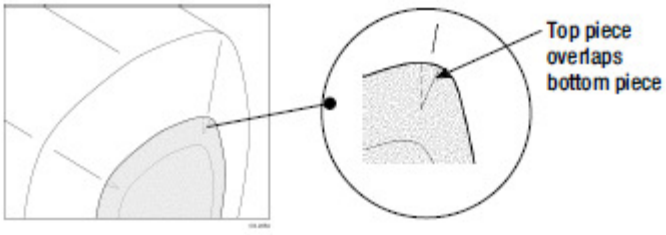


3M Special Applications and Vehicles – (continued)

5. Overlap the excess film so that the upper piece overlaps the lower piece. See FIGURE 2.
6. Make absolutely sure that the contact areas are clean, and then wrap the cut film edges around the hood, door, window and/or trunk openings.

Note: The most common reason for graphic failure (edge lifting) at seams and openings is dirt or other contamination.

FIGURE 2
Overlapping Cut Film Pieces



Concave Contours

1. Clean the substrate thoroughly using detergent and water followed by a solvent wipe.

Using Primer 94

2. Use primer 94 to help the film adhere in concave and corner areas.
   - This primer works well with most films.
   - It is not suitable for films with an adhesive that is "removable with heat only," which includes film series 160, 8640 and all perforated window graphic films.
   - Removing films from areas that are primed is more difficult than removing film from unprimed areas.
3. Shake the primer well before using.
4. Apply the primer as thinly as possible in a uniform coating. Apply it ONLY in the base or small radius areas; not the entire contour.
5. Allow the primer to dry.
6. Clean off any excess primer with isopropyl alcohol.

Apply the Graphic

1. Apply the graphic to the largest flat area first, then to other large flat areas.
2. Remove the application tape, if it is present.
3. Heat the film until it becomes soft and conformable.

Important Note!

Judging the Right Amount of Heat

- Heat softens the adhesive, which assures good initial adhesion.
- The right amount of heat allows the graphic to be stretched so that it will conform to the complex contour.
- Too much heat makes the films too soft and difficult to handle. It can also melt or shrivel the film.
- Insufficient heat may cause the film to tear rather than stretch. It may also eventually lift out of the recesses.

Important Note!

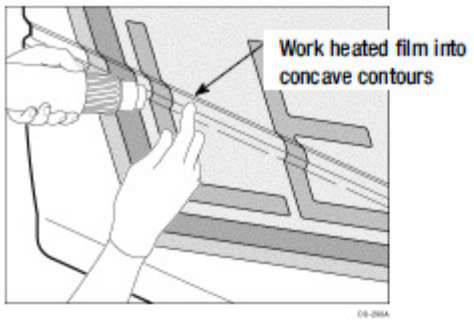
Stretching Film

Stretching the film too much can cause tears and breaks.

3M Special Applications and Vehicles – (continued)

4. Gently stretch, push or form the film into the concave area with your hands. Wear cotton gloves for protection. See FIGURE 3.

FIGURE 3
Working Film into Concave Contours



5. Wherever the film has been stretched and formed into channels and corners, carefully make a single cut through the film along the entire length of that channel or corner. Be careful not to damage the substrate. Cutting relieves the stress on the stretched film and prevents the graphic from tenting. If the film has not been sufficiently heated and/or it has been stretched too much, it may shrink slightly in the cut area.

Note: Cutting too deeply will permanently damage the substrate.

6. Remove all trapped air using a pin or air release tool.
7. Carefully cut all substrate seams and openings such as body panel, hood, door, window and/or trunk seams.
8. Make absolutely sure that the contact areas are clean, and then wrap the cut film edges around the hood, door, window and/or trunk openings. Primer 94 can be used in these areas to ensure better adhesion.

Note: The most common reason for graphic failure (edge lifting) at seams and openings is dirt or other contamination.

9. Heat the edges and re-squeegee all seams, film edges and cuts.

Vehicle Applications

The term "vehicle" refers to commercial fleet, buses, vans, automobiles and watercraft unless otherwise noted.

Buses

Use the following techniques in conjunction with Instruction Bulletin 5.5 or Instruction Bulletin 5.36. Additional techniques for applying permanent, changeable or removable graphics are similar to that for other vehicles.

Also see Vehicle and Store Windows, page 15.

⚠ WARNING

Special Bus Application Safety Information

The Office of Vehicle Safety Compliance of the U.S. National Highway Traffic Safety Administration (NHTSA) has asked for 3M's assistance in communicating an important safety concern. NHTSA has observed that graphic films used for bus wraps could be, and in some cases have been, applied in such a way as to block or restrict emergency window exits.

Penalties For Non-compliance

Failure to trim film away from rubber gaskets surrounding emergency exit windows can render an emergency exit inoperable. This is a violation of Title 49 United States Code section 30122. Substantial civil penalties as set forth in Title 49 United States Code section 30165 may be incurred for such a violation.

3M Special Applications and Vehicles – (continued)

Buses, *Continued*

1. Inspect the bus for areas that have the potential for paint failure. Any visible signs of paint peeling, lifting or bubbling, or rust indicates poor paint to substrate adhesion. Areas to pay special attention to are:
   - Bus rear
   - Wheel wells
   - Air intake vents
   - Windows
   - Rub rails
   - Air conditioning grills
2. Repair any problem areas according to the manufacturer's instructions, including the application of a prime coat. Only a *fully-cured* prime coat is needed.
3. Clean the bus thoroughly. Pay special attention to oily areas such as the rear of the bus.
4. Document all places where paint adhesion may be a problem. Obtain a customer sign-off using the Pre-installation Review found in Instruction Bulletin 5.36. A signed review is required as a condition for warranty on buses. See the 3M Related Literature section.
5. Film may not adhere to certain areas of the bus, including:
   - Rubber
   - Window and door gaskets
   - Plastics

Conspicuity

For application methods and graphic placement, see:

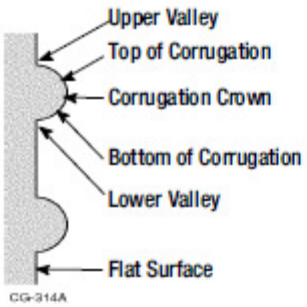
- Instruction Folder 4.9, *3M™ Diamond Grade™ and Flexible Prismatic Conspicuity Markings Application Instructions*, which discusses 3M™ Diamond Grade™ Conspicuity Markings Series 983.
- Instruction Bulletin 5.12, *Cutting and Applying Curtain Sided Vehicle Film*

Corrugations

The correct application method is to wrap the film around the corrugations. Do not bridge the film from one corrugation to the next and then use heat to push the film into the flat area. The film will tent in the valleys and cause the graphic to fail prematurely.

The profile of a standard corrugation has flat areas alternating with raised, rounded areas. FIGURE 4 identifies the parts of the profile by name.

FIGURE 4
Profile of a Standard Corrugation



Applying Film To Corrugated Surfaces

1. Review Instruction Bulletin 5.5 for pre-application information and hinge methods.
2. Position the film so that the top edge is on a flat surface and not a corrugation.
3. For multi-panel graphics, start 1/3 to 1/2 the distance down from the top edge of the film. This minimizes stretching and registration problems.

3M Special Applications and Vehicles – (continued)

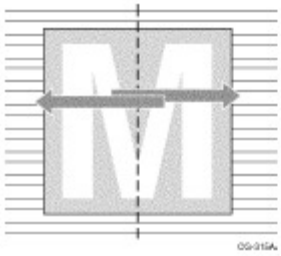
Application Technique for Corrugated Surfaces

Note: Be sure to use a gold or blue plastic applicator (also called a squeegee) for this procedure. The blue applicator is softer and allows you to conform it around corrugations.

Note: You can substitute a rivet brush for a plastic applicator in all of these sequences.

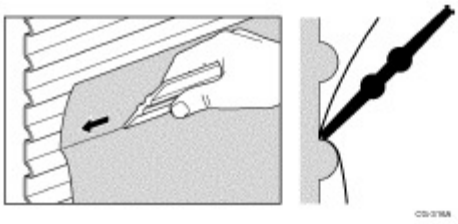
1. In the application sequence that follows, use these four techniques in each step. Each step shows the correction position to hold and use the applicator tool.
2. Start all squeegee strokes near the vertical center of the film.
3. Squeegee all the way to an edge.
4. Return to the center.
5. Starting at a place that overlaps the previous stroke by about 50%, repeat the procedure to the opposite edge. Use this technique for the upper valley, top of the corrugation, the corrugation crown, the bottom of the corrugation, and the lower valley. See FIGURE 5.

FIGURE 5
Overlap Your Squeegee Strokes



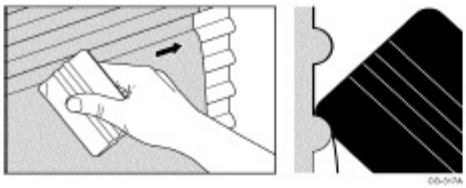
6. Use the edge of the plastic applicator in a continuous motion to bead the upper valley. See FIGURE 6.

FIGURE 6
Bead the Upper Valley



7. Apply the film to the top of the corrugation with the corner of the plastic applicator. See RGURE 7.

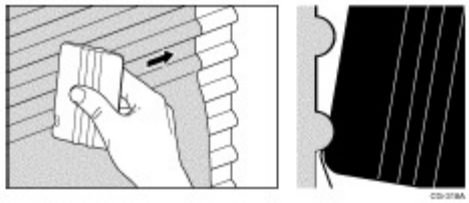
FIGURE 7
Squeegee the Top of the Corrugation



8. Squeegee the film along the crown of the corrugation using the edge of the plastic applicator. Use enough pressure to make the plastic applicator curl around the corrugation crown. This makes the film drape under the corrugation without pre-adhering it to the flat surface below. See RGURE 8.
9. Conform the film around the bottom corrugation.

3M Special Applications and Vehicles – (continued)

FIGURE 8
Squeegee Crown of Corrugation



Option 1: Using Your Thumb

10. Use your thumb to firmly press the film along the corrugation's bottom and lower valley. This step conforms the film around the bottom corrugation, reducing the amount of film stretching and wrinkling. We recommend wearing a glove as this technique tends to be abrasive on your skin. See FIGURE 9.
11. Squeegee the bottom corrugation with the corner of the plastic applicator. The thumb method alone does not adequately adhere the film to the surface. See FIGURE 10.

FIGURE 9
Conform Lower Valley with Your Thumb

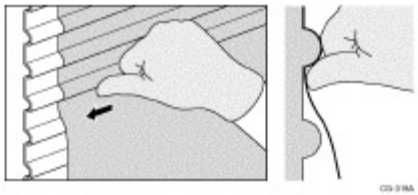
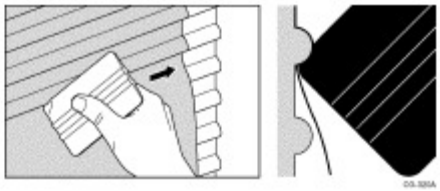


FIGURE 10
Squeegee Bottom Corrugation



Option 2: Using a Rivet Brush

12. You can use a rivet brush for any corrugations where the distance between corrugations is 1.5 inches (3.8 cm). Do not use a rag. See FIGURE 11.
13. Bead the lower valley using the edge of the plastic applicator. The thumb method does not adequately adhere the film to the surface. See FIGURE 12.

FIGURE 11
Conform Lower Valley with Rivet Brush

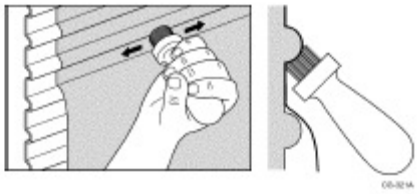
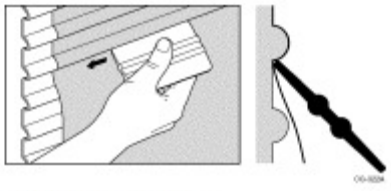


FIGURE 12
Bead Lower Valley



14. Apply the film to the flat area.

Option 1: Squeegee the film, starting from the lower valley and moving to the upper valley of the next corrugation. Always start at the lower valley. Use overlapping strokes and firm pressure. See FIGURE 13.

Option 2: An alternate method is to use the rivet brush. Avoid premature application to the top of the next corrugation. This causes the film to stretch. See FIGURE 14.

15. Repeat steps 6 through 14 to the bottom of the graphic.

16. To apply the top half of the graphic, repeat Steps 2 through 7 in reverse:
    a. Adhere the film to the flat surface (Step 7).
    b. Bead the lower valley (Step 6).
    c. Conform the film around the bottom corrugation (Step 5).
    d. Squeegee the film along the crown of the corrugation (Step 4).
    e. Apply the film to the top of the corrugation (Step 3).
    f. Bead the upper valley (Step 2).

FIGURE 13
Use Squeegee to Adhere Film to Flat Areas

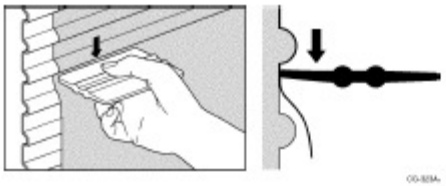
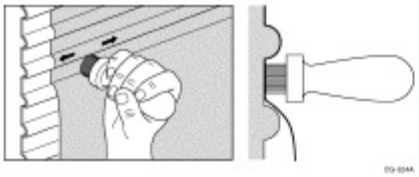


FIGURE 14
Use Rivet Brush to Adhere Film to Flat Areas



Finishing

Please review the Finishing section of Instruction Bulletin 5.5, which provides important details for successful finishing.

1. Starting from a corner and working across the diagonal of the graphic, pull the application tape back over on itself, as shown. See FIGURE 15.
2. Re-squeegee all seams and outer edges with the plastic applicator and a low friction sleeve. Using firm pressure in an upward and downward motion. See RGURE 16.

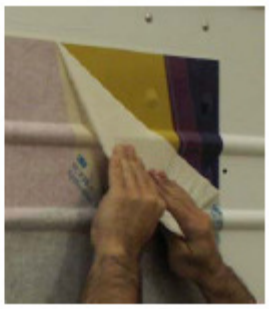
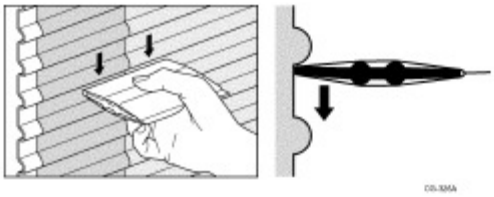


FIGURE 15
Remove Application Tape

FIGURE 16
Re-squeegee Seams



3. Re-bead the upper and lower valley of each corrugation at the film overlaps. Use firm pressure with the plastic applicator. Failure to do this step will result in lifting of the top film layer. See RGURE 17.
4. Run your finger along the top and bottom of the corrugations to check for air bubbles. Remove any trapped air in the valleys. See FIGURE 18.
5. Follow the steps found in the Finishing section of Instruction Bulletin 5.5.

3M Special Applications and Vehicles – (continued)

FIGURE 17
Re-bead Upper and Lower Valleys

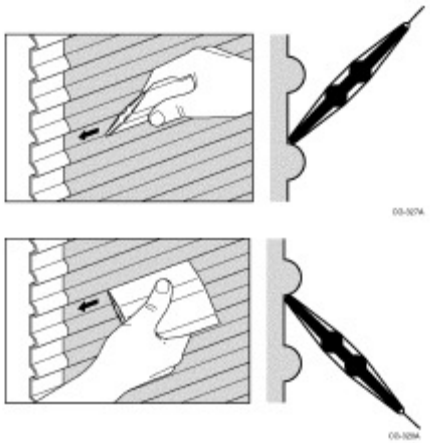
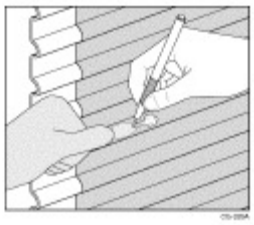


FIGURE 18
Remove Air Trapped in Valleys



Painted-in Graphics

Application tape protects the graphic from staining when overpainted with most finish paints. You can apply premasked graphics to the prime coat and then apply the finish coat. This effectively edge seals the graphic by imbedding the graphic in the paint.

Note: Always test premasked graphics for paint resistance prior to using this technique.

1. Apply the film. See Instruction Bulletin 5.5. Stop when you get to the Finishing section and return to this procedure. Do NOT remove the application tape.
2. Prepare the body seams.
   a. Slit the film at all body seams with a razor blade or similar cutting tool. See FIGURE 19.
   b. Then cover the slit body seams with a 2 inch (5.1 cm) wide strip of masking tape. See FIGURE 20.

FIGURE 19
Slitting Body Seams

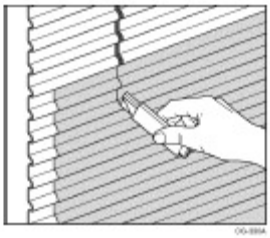
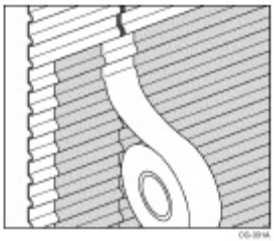


FIGURE 20
Taping Slit Body Seams



3M Special Applications and Vehicles – (continued)

3. Apply multi-panel graphics. Refer to FIGURE 21A to FIGURE24C.
   a. Apply the first panel and squeegee in place.
   b. Pull back the application tape approximately 1/2 inch (12 mm).
   c. Apply the next piece of film over the edge of the first piece by 1/4 to 1/2 inch (6 to 12 mm). Do not apply the film over the application tape. Lay the application tape over the overlap.
   d. Cover the seam with a 2 inch (51 cm) wide piece of masking tape.
4. Apply paint in the desired areas.

FIGURE 21A
Applying Multi-Panel Graphics, First Panel

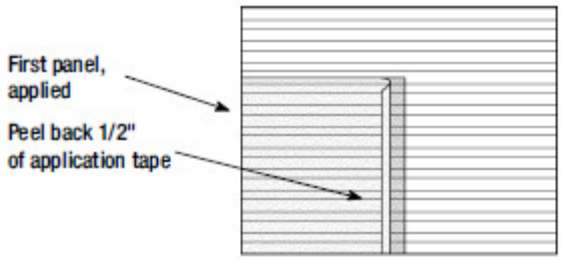


FIGURE 24B
Applying Multi-Panel Graphics, Second Panel

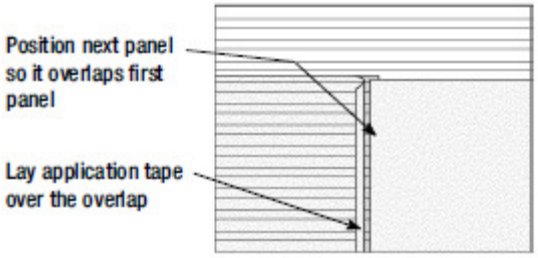
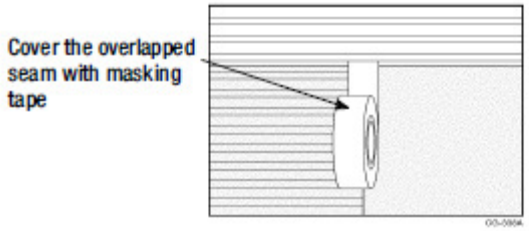


FIGURE 24C
Applying Multi-Panel Graphics, Covering Overlapped Seam

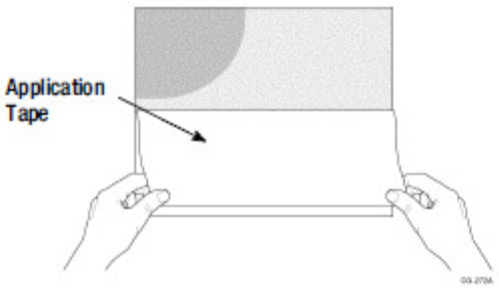


5. While the final paint coat is still tacky but not wet, remove the application tape by pulling it directly back on itself at a 180 degree angle. See FIGURE 22.

   If the application tape will be left on during the paint's heat cycle:

   - Test to make sure that the paint will not strike through.
   - Test to make sure the application tape can still be removed after the heat cycle. Heat tends to increase the bond and you may not be able to remove the application tape.

FIGURE 22
Removing Application Tape



3M Special Applications and Vehicles – (continued)

Roll-up Doors

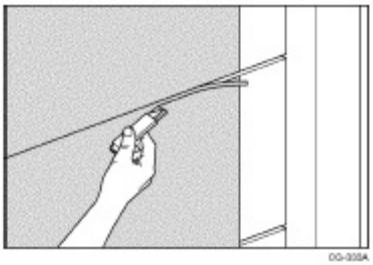
The film on roll-up doors must be cut at all door fold seams. This requires two cuts to remove a thin strip of film between each seam. Two common reasons for graphic failure (edge lifting) at these seams are: (1) dirty door fold seams, and (2) film that extends over the seam or is not securely adhered to the substrate.

1. Make sure that the inside of the door seam is washed clean and then dried. Lift the door enough to thoroughly clean the top and bottom lips of the panels. See FIGURE 23.
2. Check the door construction. If they are covered with plastic but are not painted, they require a specific film or special application technique. Refer to Instruction Bulletin 5.1 for cleaning and surface preparation techniques.
3. Apply the film. See Instruction Bulletin 5.5.
4. Remove the application tape.

FIGURE 23
Cleaning the Door Fold Seams

5. Hold the cutting tool at a 45° angle and cut along both edges of the door fold seam. Remove the thin strip of film. See FIGURE 24.
6. Separate the panels by moving them apart as far as possible.
7. Heat the edges and squeegee the film, starting in the center and working to the edges.
8. Edge sealing is optional.

FIGURE 24
Cutting at the Door Fold Seams



Thermacube™ Trailers

Thermacube trailers have vertical corrugations. Refer to FIGURE 26.

1. Refer to Instruction Bulletin 5.5. Use the vertical hinge method to start the application. See FIGURE 25.
2. Apply the film using the same squeegee techniques as for corrugations. See *Application Technique for Corrugated Surfaces* on page 9 of this bulletin.

Note: The film MUST conform to the vertical recesses.

3. Re-squeegee all outer edges.
4. Cut the film in the vertical recesses of the two inside corners. See FIGURE 26.
5. Cut the film at all panel overlaps.

3M Special Applications and Vehicles – (continued)

FIGURE 25
Vertical Hinge

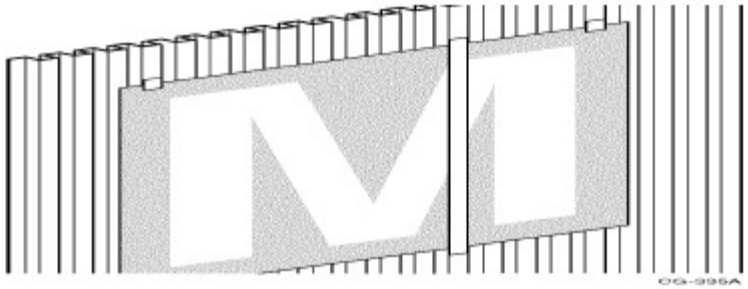
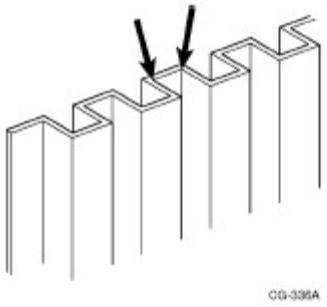


FIGURE 26
Thermacube Panel
Cutting the Film In Recesses



Vehicle and Architectural Windows

Application Restrictions

3M Commercial Graphics Division policy is not to support applications of perforated window graphic film when a driver's view is obstructed and/or where local laws prohibit its use.

The following uses and applications are specifically NOT recommended or warranted for perforated graphic film:

Restrictions for Architectural Graphics

- Non-vertical window surfaces.
- Windows with built-in heating or defrosting elements.
- Windows with coatings such as anti-reflection and scratch resistance.
- Window gaskets and rubber moldings.

Restrictions for Vehicle Window Graphics Only

- Graphics that are not trimmed away from all openings of any emergency window exit. See page 7 for additional details.
- Windows with windshield wipers.
- Application to windows that crank or roll down, rubber moldings or window gaskets
- Non-laminated or improperly laminated film on exterior windows that require an optically clear view.

⚠ WARNING

Applications that require an optically-clear view, such as vehicle window exteriors, must be laminated with overlaminate 8914. Failure to apply this overlaminate could result in obstructed or impaired viewing when the product becomes wet.

⚠ CAUTION

Some states have laws or regulations requiring minimum light transmission that may limit or preclude the use of this product on regulated vehicle windows, which may include passenger vehicles and vans. The user is responsible for determining and complying with all applicable standards.

Application Tapes for Digital Images

Do NOT use an application tape (premasking or prespacing) on film that has been laminated with overlaminate 8914. The adhesive of the application tape can pull the overlaminate off the graphic.

Application Temperature

Do not apply graphics if the air or surface temperature is less than 40°F (4°C).

3M Special Applications and Vehicles – (continued)

Safety Guidelines for Applying Vehicle Window Graphics

- Before applying film, open all emergency exit windows to determine exactly where graphics must be trimmed to ensure no interference with the operation of these windows.
- If an emergency window is non-functioning, it is your responsibility to alert the bus maintenance personnel before proceeding.
- Always trim the film 1/8 - 1/4 inch away from all rubber gaskets. Do not apply film over rubber gaskets.
- Do not allow any graphic film, whether applied to windows or bus body, to overlap the opening of an emergency window exit.
- After graphic installation is completed, ensure that all emergency window exits are fully functional.

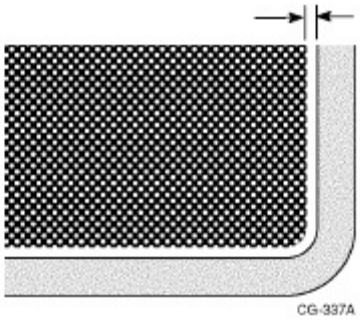
Sizing the Window

Measure the window opening and the graphic to make sure that it fits on the window. Apply the graphic and then cut away a margin of 1/8 to 1/4 inch (3 to 6 mm) all around the graphic. See FIGURE 27. This eliminates the need for edge sealing on full window coverage.

Do NOT apply the any film to any rubber gaskets or parts on the buses. This minimizes the chance of the graphic lifting, or absorbing water that may collect in the window edge. It also eliminates the need for edge sealing on full window coverages.

Do NOT allow any film to overlap the openings for any emergency window exits, which can prevent the window from operating properly in an emergency.

FIGURE 27
Leave a Space All Around the Window



Applying Perforated Window Graphic Film

Note: Before applying the film, be sure you understand what method of edge sealing will be used. See the next page.

1. Make sure that the glass is clean. Some glass has coatings that can prevent the graphic from adhering adequately. See Instruction Bulletin 5.1 for details on cleaning and how to determine whether there is a coating.
2. Always use a dry application method. Refer to Instruction Bulletin 5.5.
3. Use a low-friction sleeve on the plastic applicator to prevent scratching.
4. During application:
   - Do not stretch the film into the window well or onto the window itself, which causes tension that can resulting the graphic shrinking and its edges curling.
   - Cut the film to the approximate shape of the window before squeegeeing it. To do this, tack down the film in the center of the window, cut the graphic to shape, and squeegee the film to the window.
   - Do not use a heat source directly on the window. This can cause the film to shrink and its edges to curl.
5. When the application is completed and all window film has been trimmed, RESQUEEGEE ALL EDGES to ensure the best adhesion.

Painted Metal Surfaces Between Windows

If window graphic film is applied to narrow painted metal surfaces between windows, the image may not look consistent. To maintain a consistent image, an opaque 3M vinyl film may be applied to the surfaces between windows before the perforated film is applied. The color of vinyl film used depends on the image you want.

3M Special Applications and Vehicles – (continued)

Seaming Side-by-Side Panels

If two panels are designed to meet side by side on a window, carefully trim the images so that the panels meet and form a butt seam. Do NOT overlap the panels. Always trim before starting the application. Do NOT cut the film while it is on the window as this may permanently scratch some window surfaces.

Edge Sealing Recommendations

Edge sealing improves the resistance to environmental damage and enhances the durability of the graphics. We recommend using one of these easy options on graphic edges.

You can order narrow rolls of overlaminate 8914 from 3M. Use part number 75-3469-0233-3 and specify 1/2 inch x 50 yard (13 mm x 43 m) rolls, or you may cut 1/2 inch (13 mm) rolls from your inventory of overlaminate 8914.

Option 1: Seal Edges with Strips of Overlaminate

This method can be used whether your graphic has overlaminate 8914 or a screen printed clear coat applied.

Apply a 1/2 inch (13 mm) strip of overlaminate 8914 so each strip evenly straddles the perforated film and substrate. Overlap the corners. See FIGURE 28 and FIGURE 29.

Important Note!

Never allow film or overlaminate to touch the rubber window molding.

FIGURE 28
Applying 8914 Edge Sealing Tape

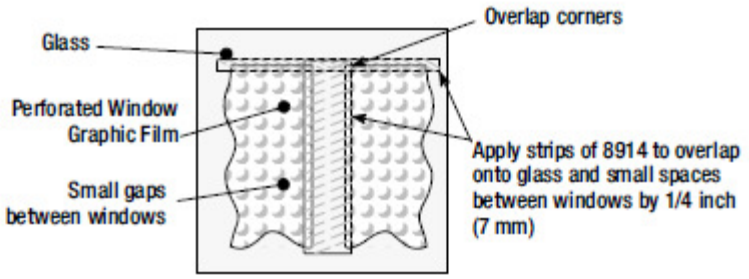
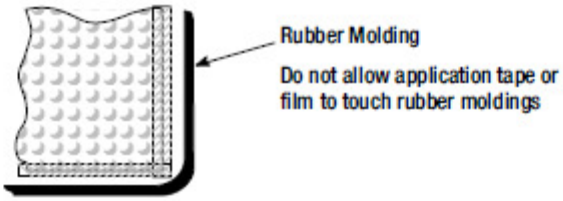

Glass
Overlap corners
Perforated Window Graphic Film
Small gaps between windows
Apply strips of 8914 to overlap onto glass and small spaces between windows by 1/4 inch (7 mm)

FIGURE 29
Avoid Rubber Moldings

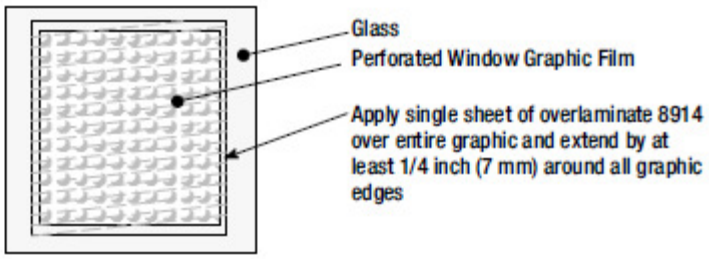


Option 2: Apply Oversized Piece of Overlaminate

This method is for use by experienced applicators and should be used only on graphics that cover just part of a window or have irregular shapes.

Cut overlaminate 8914 so it is at least 1/4 inch (7 mm) larger than the graphic and apply so it overlaps all edges of the perforated film. Contact us for more details, if needed. See FIGURE 30 and FIGURE 29.

FIGURE 30
Optional: Apply single sheet of overlaminate 8914 over entire graphic


Glass
Perforated Window Graphic Film
Apply single sheet of overlaminate 8914 over entire graphic and extend by at least 1/4 inch (7 mm) around all graphic edges

Warranty and Limited Remedy

The information contained and techniques described herein are believed to be reliable, but 3M makes no warranties, express or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose. 3M shall not be liable for any loss or damages, whether direct, indirect, special, incidental or consequential, in any way related to the techniques or information described herein.

3M Special Applications and Vehicles – (continued)

3M Related Literature

Before starting any job, be sure you have the most current Product and Instruction Bulletins.

The information in 3M Product and Instruction Bulletins is subject to change. Current Bulletins are available at 3Mgraphics.com. The following applicable Bulletins provide information and processes you need to properly make the graphics described in this Bulletin. Additional Bulletins may be needed as indicated in the 3M Related Literature section of other 3M components you use.

Bulletin types: PB = Product Bulletin; PB-IB = Product & Instruction Bulletin; IB = Instruction Bulletin

Subject	Type	Bulletin No.
Films, Substrates, Overlaminates, Inks and Clears Please visit our website to identify and obtain the additional Product and Instruction Bulletins you need for a successful application.		
Application, substrate selection, preparation and substrate-specific application techniques	IB	5.1
Application, general procedures for indoor and outdoor dry applications	IB	5.5
Cutting and applying curtain sided vehicle film	IB	5.12
Applicator's quick reference guide for vehicle film	IB	5.35
Application techniques for automobiles, vans and buses and inspection forms	IB	5.36
A guide to understanding and applying graphics to common smooth and textured wall surfaces	IB	5.37
Application: Special Considerations for Watercraft	IB	5.42
Application and Maintenance of Petroleum Pump Graphics	IB	5.44
Application Techniques for Railcars	IB	5.45
Storage, handling, maintenance, removal	IB	6.5
3M Graphics Center Warranty Brochure	go to www.3Mgraphics.com, Warranties	

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Thermacube is a registered trademark of Great Dane Trailers.

Bulletin Change Summary

Improved layout. Added more explanatory information as marked by black bars in the margins. Corrected Figure 16, which shows the proper way to remove application tape.

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3M

Instruction Bulletin 5.36
Release J, Effective March 2012
See Bulletin Change Summary at end of Bulletin

Application Techniques for Automobiles, Vans and Buses

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General Information

- This Bulletin is specifically for the application of films used for complex contours of automobiles, vans and buses.
- Be sure you obtain and use the most current supporting Product and Instruction Bulletins referenced in this Bulletin.
- Make sure each applicator reads this Bulletin before beginning.
- Follow each step in the order given. Do not take short cuts.

Pre-installation Inspection Record Requirement

3M requires that a properly executed and signed Pre-installation Inspection Record be completed before any 3M graphics are applied. This record, which identifies any potential problem areas, is mandatory if a warranty claim is made in the future. Make a copy of the appropriate record, located at the end of this Bulletin, for each vehicle.

3M recommends graphics manufacturers clearly define mutual obligations between the vehicle graphics operating companies and themselves and strongly suggests that graphics manufacturers seek written limitations of claims or liabilities on individual vehicles for unsound paint.

Films and Inks

About Film Memory

Most traditional graphic film has a memory for its original shape. Stretching the film results in some shrinkage as it attempts to return to its original dimensions. As it shrinks, some minor tenting and lifting occurs. Heating traditional film helps void its memory, which reduces tenting and lifting.

3M™ Controltac™ Wrap Film with Comply™ Adhesive IJ380Cv3 features a new 3M technology that significantly reduces its memory once the film is applied and post-heated providing superior conformability and lifting resistance in deep channels or concave areas.

Selected films have superior stretchability and lifting resistance. When printed with solvent-based inks, 3M™ Controltac™ Graphic Film with Comply™ Adhesive IJ180, IJ180C and IJ180Cv3 with 3M™ Scotchcal™ Overlaminates 8518, 8519, 8520, 8915 or 8528 can be stretched by a factor of 30% without using primer or making relief cuts. Film IJ380Cv3 with overlaminate 8580 can be stretched by a factor of 50% without using primer or making relief cuts. When stretching at higher levels, primer and/or relief cuts are required.

3M Application Techniques Automobiles, Vans & Buses – (continued)

Choosing the Best Film for Application to Contoured Surfaces

Covering complex curves and contours requires special techniques, including heating and stretching the film. The specific characteristics of a film and the inks with which it is printed, as well as whether the shape is concave or convex, determine how well the film stays bonded to the curved substrate. For the best application and removal results, we recommend 3M's 2-mil, removable or changeable graphic films. Two-mil films have less tendency to lift from contoured surfaces. Although all films may tent to some extent when stretched, films with changeable adhesive and all non-cast films tend to tent the most.

Recommended 3M films are listed below. Refer to the Product Bulletin for the films you are using for complete product construction recommendations, warranties and other important information.

Graphics made with the following constructions are not designed to be stretched and are not warranted for use on complex curves, contoured surfaces or deep draws:

- Polyolefin films and overlaminates, including 3M™ Controltac™ Graphic Film 3545C and 3M™ Scotchcal™ Overlaminates 8908 or 8909
- 3M™ Scotchlite™ Reflective Graphic Films (stretching damages the reflectivity)
- Polyester films or overlaminates such as 3M™ Scotchcal™ Overlaminates 8912, 8991 or 8991R.

Adhesive Considerations

The 3M recommended films are removable or changeable and have pressure-activated adhesive that is slideable, positionable and repositionable until firm application pressure is applied. Many of these films also include 3M's original Comply™ Adhesive as well as Comply™ v2 Adhesive or Comply™ v3 Adhesive, all of which improve speed and ease of application with virtually no trapped air bubbles.

Films with changeable adhesive are typically recommended for applications of less than one year, These films have lower adhesion, usually in the range of 2 to 5 pounds per inch (0.4 to 0.9 kg/cm) peel-back adhesion, which allows the film to be removed easily without the aid of heat or chemicals and without adhesive residue. However, its lower adhesion may result in some lifting of film in areas where the film is highly stretched. In addition, such films may not adhere well to low surface energy (LSE) paints such as on 2007 Ford Econoline vans, Dodge Sprinter vans, etc. These potential application problems are not covered by any 3M warranty.

Effect of Ink on Film's Ability to Stretch

Unprinted films have the most ability to stretch. Graphics printed with UV piezo inkjet inks cannot be stretched as much as graphics printed with solvent inkjet inks without the UV inks showing signs of cracking, which is normal and not covered by the warranty. Keep this in mind when selecting a printing platform. Also read about the effective of using application heat with UV piezo inkjet inks on page 6. Refer to the specific ink and film Product Bulletins for comments on special application techniques or limitations of use.

Films Recommended for Short to Long Term Applications

Screen Printing

- 3M™ Controltac™ Graphic Film Series 180
- 3M™ Controltac™ Graphic Film with Comply™ Adhesive Series 180C
- 3M™ Controltac™ Graphic Film with Comply™ v2 Adhesive Series 180Cv2

Piezo Inkjet Printing

- 3M™ Controltac™ Graphic Film IJ180-10, RG180-10
- 3M™ Controltac™ Graphic Film with Comply™ Adhesive IJ180C-10, all versions
- 3M™ Controltac™ Graphic Film with Comply™ Adhesive IJ180Cv3-10, all versions
- 3M™ Controltac™™ Wrap Film with Comply™ Adhesive IJ380Cv3-10

Electrostatic Printing

- 3M™ Controltac™ Conformable Graphic Film 8620 ES
- 3M™ Controltac™ Conformable Graphic Film with Comply™ Adhesive 8620C ES
- 3M™ Controltac™ Conformable Graphic Film with Comply™ Adhesive 8620Cv3 ES

Continued on the next page.

3M Application Techniques Automobiles, Vans & Buses – (continued)

Films Recommended for Applications of LESS Than One Year

Screen Printing

- 3M™ Controltac™ Changeable Graphic Film Series 3552C

Inkjet Printing

- 3M™ Controltac™™ Changeable Graphic Film with Comply™ Adhesive IJ3552C, FN3552C, RG3552C

Electrostatic Printing

- 3M™ Controltac™ Changeable Graphic Film Series 8652C ES

Health and Safety

⚠ CAUTION

When handling any chemical products, read the manufacturers' container labels and the Material Safety Data Sheets (MSDS) for important health, safety and environmental information. To obtain MSDS sheets for 3M products go to 3M.com/MSDS, or by mail or in case of an emergency, call 1-800-364-3577 or 1-651-737-6501.

When using any equipment, always follow the manufacturers' instructions for safe operation.

Air Quality Regulations

State Volatile Organic Compound (VOC) regulations may prohibit the use of certain cleaning chemicals with VOC's in graphic arts coatings and printing operations. For example, the California South Coast Air Quality Management District prohibits use of certain solvent-based solutions without a permit and other California AQMD's prohibit use of certain solutions without a permit or a regulatory exemption. Check with your State environmental authorities to determine whether use of this solution may be restricted or prohibited.

⚠ CAUTION

Any activity performed for a long period of time in an awkward position or with a high amount of force is potentially a risk for causing musculoskeletal strain, pain or injury. When applying graphics, follow these practices to improve comfort and avoid injury:

- Alternate your tasks during the application.
- Schedule regular breaks.
- Perform stretches or do exercises to improve circulation.
- Avoid awkward reaching.

Surface Preparation

Clean the Surface

All substrates must be considered contaminated. Clean the substrate immediately before applying the film. Dust and other contaminants can collect quickly on the substrate and prevent the film from adhering properly. Even a freshly painted substrate can collect dust before graphics can be applied.

1. Use a solution of 1 ounce of liquid dishwashing detergent, such as Joy® or Dawn®, per gallon of lukewarm water to thoroughly clean the vehicle. Rinse with water.
   - Avoid soaps or preparations that contain waxes, oils or lotions; some window cleaners contain waxes!
   - Be aware that the chemicals used in some automated vehicle washing equipment may prevent good film adhesion.
   - Pay particular attention to cleaning the front and rear of the vehicle, which tend to have more dirt, oil and dead insects.
2. Dry the surface thoroughly with clean, lint-free paper towels. A heat gun may be used to apply moderate heat and accelerate the drying.
   - Moisture prevents the adhesive from adhering correctly, can cause bubbles, and can freeze in cold environments. Any moisture trapped beneath the graphic will cause the graphic to fail prematurely.
   - Moisture on the substrate results from:
     - Inadequate drying after cleaning as well as from application solutions.
     - Condensation at low temperatures.
     - High humidity environments.

Continued on the next page.

3. Wipe the surface again with a solvent-based cleaner. Refer to the list of cleaners, page 4. Be sure that the cleaner does not damage the vehicle's paint.

   Note: Car wax can greatly reduce graphic adhesion. Solvent-based cleaners must be used to thoroughly remove any wax residue. Alcohol-based cleaners do *not* remove wax as effectively.

   c. Saturate a clean paper towel with a solvent.

   d. Wipe with a lint-free paper towel before the solvent evaporates from the substrate. As the paper towel becomes dirty, discard it. A dirty towel will simply move the dirt around, rather than remove it.

   e. Make sure the substrate is completely dry. If necessary, use a heat gun to dry any retained solvents.

4. Apply the graphic immediately. Dust and contaminants prevent the adhesive from performing as expected.

Cleaning Products and Tools

This list of cleaners is provided for your convenience; other acceptable cleaners may be available. 3M does not endorse any particular chemical manufacturer or supplier.

Lower Solvent Content Cleaners

- 3M™ Prep Solvent-70, 8983 [1]
- Other suitable products may be available from your local building products store.

Petroleum Distillate-based Cleaners

- 3M™ Adhesive Cleaner and Wax Remover 8984 [1]
- DuPont Prep-Sol™ Solvent Cleaner 3919S [2]
- Sherwin Williams R7K156 Sher-Will-Clean™ [2]
- Sherwin Williams R7K158 Sher-Will-Clean™ [2]

Application Tools

- 3M™ Plastic Applicator (squeegee) PA-1 [1]
- 3M™ Low Friction Sleeve SA-1 [1] *Use a low friction sleeve on the plastic applicator to minimize the possibility of surface scratching.*
- 3M™ Scotchmate™ Reclosable Hook and Loop Fastener - Loop portion SJ-3523 [1] *apply to applicator PA-1 as an alternate to sleeve SA-1*
- 3M™ Rivet Brush RBA-1 or RBA-3 [1]
- 3M™ Air Release Tool 391X [1]
- 3M™ Tape Primer 94 [1]
- 3M™ Vehicle Channel Applicator Tool VCAT-2 [1] *See page 6 for information.*
- 3M™ Roller L and Roller S [1] *See page 6 for information.*
- 3M™ Citrus Base Industrial Cleaner [1]
- Snap-off cutting knives or razor blades in safety holders
- Industrial heat gun, or the equivalent, that is capable of attaining at least 500°F (260°C)
- Cotton gloves

[1] Available from 3M Commercial Graphics.

[2] Available from automobile supply houses handling DuPont or Sherwin Williams products.

[3] Available from chemical companies listed under "Solvents" in the Yellow Pages or mail order chemical firms, such as E. H. Sargent and Co. and Fisher Scientific.

Application Temperature and Environment

Best Application Temperature

For the best success with the films recommended for vehicle graphics, always apply the graphics when the air and vehicle surface are both above 60°F (16°C).

Continued on the next page.

3M Application Techniques Automobiles, Vans & Buses – (continued)

Cool Application Conditions

If the temperature is too cool, move the vehicle indoors to bring its surface temperature up to at least the minimum application temperature.

Below the recommended minimum application temperature:

- Films are not able to maintain the elevated temperatures required for stretching; films will cool too quickly.
- The initial bond of the adhesive may be insufficient to ensure the film stays adhered.
- Moisture may condense on the vehicle surface if the temperature of the vehicle surface is below the dew point.
- In very humid conditions, it may be difficult to keep the substrate dry.

Very Warm Application Conditions

If the temperature is too warm, move the vehicle indoors or into the shade and be sure the vehicle surface cools to below 90°F (32°C) before beginning the installation.

Above the recommended maximum application temperature:

- Graphics may pre-adhere thereby trapping air.
- The adhesive will be more aggressive.
- Controltac films may lose their positionability feature.
- The film may stretch.

Post-Application Conditions

After application of the graphic, keep the vehicle temperature above 60°F (16°C) for as long as possible—at least 12 hours is ideal—before exposing the vehicle to either a cold or wet climate; this strengthens the graphic's bond to the contoured areas.

How to Reduce or Avoid Film Lifting

Identify all areas on the vehicle where the graphics may tend to lift such as in concave channels, inside wheel wells and other underside areas of the vehicle.

Use Tape Primer

1. Use 3M's tape primer 94 to promote better film adhesion where the film will be stretched.
   - In **concave channels**, apply a thin layer of primer over most of the concave area. Allow the primer to dry for five minutes.
   - When going around **convex areas**, apply a thin layer of primer at the outer edges of the curve to prevent film edge lifting. Allow the primer to dry for five minutes.

Apply to Flat Areas First

2. Apply the film to flat areas of the vehicle first.

   Avoid areas at the underside of the vehicle. These areas are usually too difficult to clean sufficiently for proper film adhesion.

Soften Film with Heat

About Film Stretching

3M's most popular vinyl vehicle wrap films have superior stretchability and lifting resistance when heated to conform over complex contours.

When printed with solvent-based inks, films IJ180, IJ180C and IJ180Cv3 with overlaminates 8518, 8519, 8520, 8915 or 8528 can be stretched by a factor of 30% of the original film dimension and the radius of the channel is 1/4 inch (6 mm) or less without using primer or making relief cuts.

Film IJ380Cv3 with overlaminate 8580 can be stretched by a factor of 50% with the same conditions.

When stretching at higher levels, primer and/or relief cuts are required.

Important Note!

If you are using graphics printed with UV ink, read *Graphics Printed with UV Piezo Inkjet Inks are Heat Sensitive!*, page 6, before continuing.

Continued on the next page.

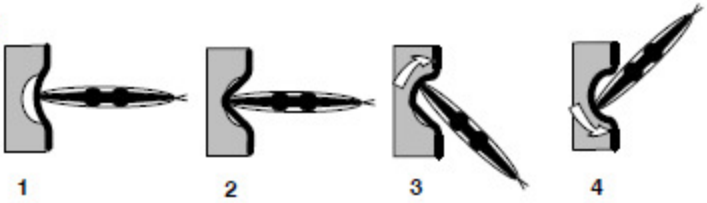
3M Application Techniques Automobiles, Vans & Buses – (continued)

How to Use Heat Soften Film

3. Use heat to soften the film when stretching it around and into complex curves.
   a. Use as much heat as possible to soften the film without burning it. Typically, heat the film to about 150-180°F (65-82°C) for convex and concave areas including bumpers and channels.
   Note: Film IJ380Cv3 are much softer films and need to be heated to only 120-130°F (50-55°C).
   b. Film cools within seconds so gently stretch the film immediately after the heat source is removed. The film should be too hot to touch with unprotected hands; be sure to wear cotton gloves.
   c. To apply film into concave channels, use cotton gloves or use a squeegee with a low friction sleeve or Scotchmate loop material applied to the edge. Press the heated and softened film into the middle of the channel first so that the film is stretched evenly across the channel. See FIGURE 1.

FIGURE 1
Technique For Stretching Heated Film into Channels

Right



Wrong

   d. Another option for deep channels is to use the 3M licensed vehicle channel applicator tool VCAT-2 or the Roller L tool to effectively work the heated film into deep channels. See FIGURE 2. Proper technique includes bridging the film over the channels, heating the film to about 150-180°F (65-82°C), and then working it into the channels. Note that film IJ380Cv3 needs to be heated to only 130°F (55°C). It is essential that you refer to Product and Instruction Bulletin VCAT-2 for complete details.

FIGURE 2
Technique For Stretching Heated Film into Channels

Tool V-Cat2

Tool Roller L

Graphics Printed with UV Inkjet Inks are Heat Sensitive!

UV inkjet inks will crack if too much heat and stretching are used during graphic application to complex curves and deep contours as well as around rivets: this is considered normal and not covered by warranty. When using a heat gun or other heat source during application, make sure the film surface temperature does not exceed 212°F (100°C).

Using additional heat in the post-application process may also cause UV piezo ink to crack.

For the best results *always do a test application* of a UV inkjet printed graphic to determine how much heat can be used without damaging the image.

Continued on the next page.

3M Application Techniques Automobiles, Vans & Buses – (continued)

Use Heat in Post-Application

4. After the film has been applied, apply heat to the graphic to reduce the internal stress in the vinyl film.
   a. Adjust the heat source so that the film temperature reaches 200°F (94°C).
   b. Move the heat source slowly across the stretched film surface.
   c. For best performance, press the stretched areas of film with 3M roller S while the vinyl is still hot. This helps fully wet-out the adhesive onto the substrate and reduces the risk of lifting. See FIGURE 3.

FIGURE 3
Use Roller S for Post-Application Finishing to Help Prevent Lifting

Stretching in Deep Channels

5. Cutting the film in deep channels relieves the inherent stress of the applied film. This technique is used with films for longer term applications, such as film 180 or 180C. Cutting is *not* recommended for shorter-term films with changeable adhesive, such as film 3552C.

   In general, cutting is not necessary if the previous application techniques have been followed unless the film is expected to lift in the high stress areas or non-recommended films were used.

Cutting Technique

   a. Identify areas where the film is stretched to greater than a factor of 30% (or 50% for films IJ380 and IJ380Cv3 with solvent-based piezo inks) of the original film dimension *and* the radius of the channel is 1/4 inch or less. See FIGURE 4. To determine the percent of stretch, measure the travel distance through the channel and divide by the length across the channel (example: 1.8" / 1.0" = 180%). See FIGURE 5.

FIGURE 4
Checking Radius of Channel

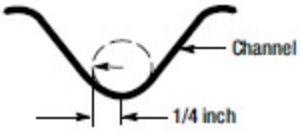
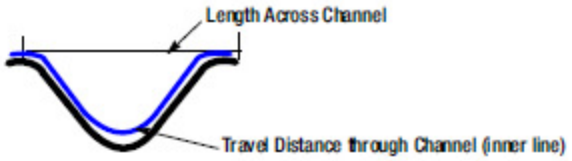
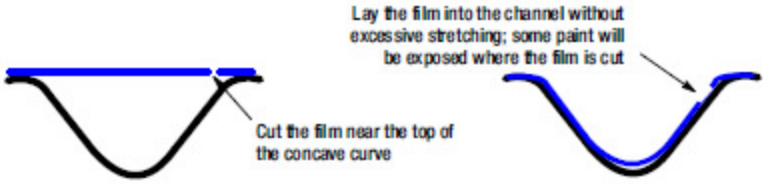


FIGURE 5
Determine Percent of Stretch



   b. Cut the film near the top of the concave curve and lay into the channel without excessive stretching; this avoid lifting of the film. Some paint will be exposed in the finished application, but should not be visible in a well planned cut. See RGURE 6.

FIGURE 6
Cut the Film in the Channel


Lay the film into the channel without excessive stretching; some paint will be exposed where the film is cut
Cut the film near the top of the concave curve

3M Application Techniques Automobiles, Vans & Buses – (continued)

Application Techniques

Application Procedure

1. Use firm, even application pressure.
2. Use overlapping squeegee strokes to be sure you don't miss any areas. Firm, consistent pressure with an applicator tool must be applied over all parts of the graphic to bond the adhesive to the substrate. A missed area leaves wrinkles and bubbles in the applied film. These are areas where premature film failures may occur.
3. Carefully cut the film at all seams in vehicle body panels, being sure not to scratch the paint. Seams on vehicles flex as the vehicle moves. If they are not cut, the graphics will pull away from the seam, resulting in premature failure.
4. Strive for a bubble-free application. Although puncturing air bubbles improves the appearance of the graphic, it can contribute to premature graphic failure if the film is torn or cut rather than neatly punctured.
5. Re-squeegee all edges and overlaps to ensure good adhesion before releasing the vehicle for use.

Avoid These Applications

- **Do not apply film in any way that restricts the safe operation of emergency window exits**. See the most current Instruction Bulletin 5.4 for details.
- Avoid applying graphics to unpainted plastic substrates. 3M does not warrant the application of film to textured plastic substrates under any circumstances. However, if you wish to try, using heat and a rivet brush to conform the film to the texture may be satisfactory for an unwarranted application.
- Do not apply the films to rubber, silicone or flexible plastics. The adhesive on the recommended films does not adhere to these materials.

⚠ WARNING

Special Bus Application Safety Information

The Office of Vehicle Safety Compliance of the U.S. National Highway Traffic Safety Administration (NHTSA) has asked for 3M's assistance in communicating an important safety concern. NHTSA has observed that graphic films used for bus wraps could be, and in some cases have been, applied in such a way as to block or restrict emergency window exits.

Penalties For Non-compliance

Failure to trim film away from rubber gaskets surrounding emergency exit windows can render an emergency exit inoperable. This is a violation of Title 49 United States Code section 30122. Substantial civil penalties as set forth in Title 49 United States Code section 30165 may be incurred for such a violation.

Important Information in Instruction Bulletin 5.5

Refer to Instruction Bulletin 5.5 for:

- Graphic placement
- Making film overlaps
- Registering the graphic
- Removing the adhesive's liner
- Application sequences (that apply to your type of graphic)

3M Application Techniques Automobiles, Vans & Buses – (continued)

Removal

Refer to the film's Product Bulletin for information on its removability, and Instruction Bulletin 6.5 for additional details on film removal.

Removal of short-term graphics with changeable adhesives will leave little or no adhesive residue. These films will not damage a soundly painted surface or a previously applied 3M vinyl graphic unless the surface was corroded, rusted, blistered, scratched or previously damaged, or if it was damaged since the graphic application.

To remove a changeable film, grasp a corner of the graphic and peel it back at approximately a 120 degree angle. In areas where tape primer 94 is used, some adhesive will remain on the vehicle. Any remaining adhesive and tape primer 94 can be removed with an adhesive cleaner such as 3M's citrus base industrial cleaner.

Warranty and Limited Remedy

The information contained and techniques described herein are believed to be reliable, but 3M makes no warranties, express or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose.

Limitation of Liability

Except where prohibited by law, 3M SHALL NOT UNDER ANY CIRCUMSTANCES BE LIABLE TO PURCHASER OR USER FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, LABOR, NON-3M MATERIAL CHARGES, LOSS OF PROFITS, REVENUE, BUSINESS, OPPORTUNITY, OR GOODWILL) RESULTING FROM OR IN ANY WAY RELATED TO SELLER'S PRODUCTS OR SERVICES. This limitation of liability applies regardless of the legal or equitable theory under which such losses or damages are sought including breach of contract, breach of warranty, negligence, strict liability, or any other legal or equitable theory.

Paint Staining or Image Ghosting

3M makes no guarantee for paint staining or image ghosting on vehicles that may be visible upon removal of the graphic. To reduce the risk of this problem, always remove the graphics by the end of the warranted durability period.

Additional Warranty Information

The 3M Commercial Graphics Warranty Brochure at 3Mgraphics.com, along with the applicable film Product Bulletins, provide the details to any warranty offered for the 3M graphics products described in this bulletin.

3M Related Literature

Before starting any job, be sure you have the most current Product and Instruction Bulletins.

The information in 3M Product and Instruction Bulletins is subject to change. Current Bulletins are available at 3Mgraphics.com. The following applicable Bulletins provide information and processes you need to properly make the graphics described in this Bulletin. Additional Bulletins may be needed as indicated in the 3M Related Literature section of other 3M components you use.

Bulletin types: PB = Product Bulletin; PB-IB = Product & Instruction Bulletin; IB = Instruction Bulletin

Subject	Type	Bulletin No.
3M™ Controltac™ Graphic Film with (or without) Comply™ Adhesive Series 180, 180C, 180Cv2	PB	180/180C
3M™ Controltac™ Changeable Graphic Film Series 3552C	PB	3552C
3M™ Controltac™ Conformable Graphic Film with (or without) Comply™ Adhesive 8620, 8620C, 8620Cv3	PB	8620/8620C
3M™ Controltac™ Changeable Graphic Film with Comply™ Adhesive 8652C	PB	8652C
Vehicle Channel Applicator Tool VCAT-2, Roller L, Roller S	PB-IB	V-Tools
3M™ Controltac™ Wrap Film with Comply™ Adhesive IJ380Cv3	PB	PIJ380Cv3
3M™ Controltac™ Graphic Film with (or without) Comply™ Adhesive IJ180, IJ180C, IJ180Cv3 all versions	PB	PIJ180/180C
3M™ Controltac™ Changeable Graphic Film with Comply™ Adhesive IJ3552C all versions	PB	PIJ3552C

Subject	Type	Bulletin No.
Application, substrate selection, preparation and substrate-specific application techniques	IB	5.1
Application, special applications and vehicles	IB	5.4
Application, general procedures for indoor and outdoor dry applications	IB	5.5
Storage, handling, maintenance, removal	IB	6.5
3M Commercial Graphics Warranty Brochure	go to www.3Mgraphics.com/Warranties	

3M, Controltac, Comply, MCS, Scotchcal, Scotchlite, Scotchmate and the 3M logo are trademarks of 3M. Dawn and Joy are registered trademarks of Proctor and Gamble.; Sher-Will-Clean is a trademark of Sherwin-Williams Company. All other trademarks are the property of their rightful owners.

Bulletin Change Summary

Modified and new content is marked with a black bar in the margin. More clarity has been added regarding the stretchability of selected films and the recommended temperature ranges for softening the film. Added warranty exclusion for paint staining and image ghosting.

PLEASE NOTE THESE REQUIRED FORMS
on the following pages:

3M Auto and Van Graphics Pre-installation Inspection Record pages 11,12

3M Bus and Mini-Bus Graphics Pre-installation Inspection Record pages 13,14

3M

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St. Paul, MN 55144-3220 USA
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Fax 1-651-736-4233

3M Canada
P.O. Box 5757
London, Ontario
Canada N6A 4T1
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Fax 519-452-6245

3M México, S.A. de C.V
Av. Santa Fe No. 55
Col. Santa Fe, Del. Alvaro Obregón
México, D.F. 01210
General 52-55-52-70-04-00
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3M Puerto Rico, Inc.
Puerto Rico Industrial Park
350 Chardon Avenue, Suite 1100
San Juan PR 00918
General 787-620-3000
Fax 787-620-3018

www.3Mgraphics.com

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3M Auto and Van Graphics Pre-installation Inspection Record *Page 1 of 2*

Note: Complete both pages of this Pre-installation Inspection Record, using a separate record for each vehicle, before each new graphic installation and between subsequent graphic installations on the same vehicle.

Installer Requirements

1. Carefully and thoroughly examine each vehicle and record all potential problem areas prior to installing the graphics. We recommend washing the vehicle so that potential problem areas are easily seen.
2. Ensure that the paint is sound so that graphics will have good adhesion to the paint. For the purpose of this program, "sound paint" is defined as paint that is free of defects (see the "Defects" bullet below).

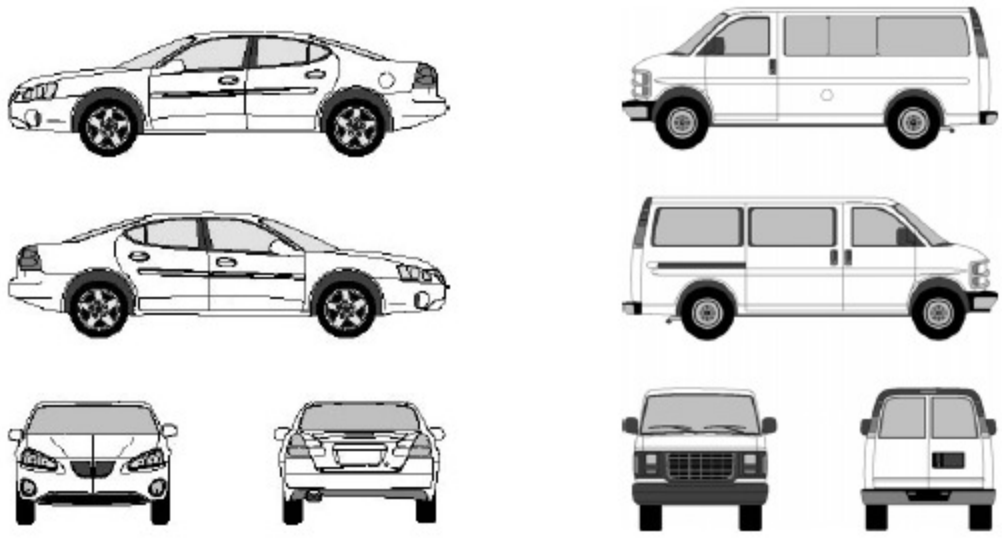
   Circle all areas on the following diagram where your inspection shows that the paint may be unsound, the graphic may adhere poorly, or graphic removal may damage the vehicle paint. This includes:
   - Defects: loose paint, dents, rough surface, fillers used for damage, rust or blistered paint.
   - Areas where water can collect, which are more likely to rust, resulting in paint adhesion problems.

Note: Primer, which does not outgas, may be applied to bad paint spots on the vehicle to prepare it for another graphic wrap. However, this must still be considered a problem area and must be documented on the Pre-installation Inspection Record.

3. Photograph all areas that you circled on the diagram as exhibiting unsound paint.
4. Explain proper graphic maintenance to the Vehicle Owner/Operator. See Instruction Bulletin 6.5.
5. Complete the Pre-installation Inspection Record (see the next page of this document).
6. Make and distribute copies to all signing parties.
7. Maintain a file with the signed form and photographs.

Warranty Claims and Exceptions

1. Failure to obtain a properly executed and signed Pre-installation Inspection Record (see the next page of this document) prior to graphic installation voids all expressed or implied 3M product warranties.
2. If the pre-inspection shows the paint is not free of defects, the owner of the vehicle waves all expressed or implied 3M product warranties.
3. 3M makes no warranty (expressed or implied) for paint or existing graphic damage that occurs during the removal of a graphic (including, but not limited to, vehicle paint staining or image ghosting that may be visible after removing a graphic). See the 3M™ MCS™ Warranty for complete details at www.3Mgraphics.com.
4. To make a claim, contact 3M Commercial Graphics Quality Direct at 1-800-511-3705 or go to www.3Mgraphics.com/qualitydirect. Be prepared to send in:
   - A piece of the 3M film exhibiting the defect.
   - A properly executed and signed 3M Pre-installation Inspection Record, including any available photographs.



Circle all areas where the paint may be unsound. Mark only one vehicle type.
(Diagrams courtesy of Digital Auto Library, 1-888-843-1325 or www.digitalauto.on.ca)

Instruction Bulletin 5.36 (Auto Inspection Form) - 11

3M Auto and Van Graphics Pre-installation Inspection Record *Page 2 of 2*

COMPLETE THIS FORM, PROVIDE A COPY FOR EACH SIGNER AND RETAIN WITH PHOTOGRAPHS IN CASE OF A CLAIM.

Please print except in signature boxes.

AUTOMOBILE OWNER/OPERATOR
COMPANY NAME
CONTACT NAME
STREET ADDRESS
CITY / STATE / ZIP
AREA CODE / PHONE NUMBER
GRAPHICS PRINTER
COMPANY NAME
CONTACT NAME
STREET ADDRESS
CITY / STATE / ZIP
AREA CODE / PHONE NUMBER
GRAPHICS INSTALLER
COMPANY NAME
CONTACT NAME
STREET ADDRESS
CITY / STATE / ZIP
AREA CODE / PHONE NUMBER

AUTOMOBILE INFORMATION	
LICENSE NUMBER	STATE
AUTOMOBILE YEAR, MAKE AND MODEL	
VIN NUMBER	
AUTOMOBILE OWNER/OPERATOR	
PRE-INSPECTION: (see the previous page of this bulletin for inspection requirements) ❑ PASSED (DATE: _____ BY: _____) ❑ FAILED (Owner waives all product warranties if graphics are applied)	
PHOTOGRAPHS OF POTENTIAL PROBLEM AREAS: ❑ YES (DATE: _____ BY: _____) ❑ NO	
GRAPHIC CONSTRUCTION AND INSTALLATION INFORMATION	
INSTALLATION DATE	
GRAPHIC COVERAGE ❑ FULL ❑ REAR ONLY ❑ TRUNK ONLY ❑ DRIVER SIDE ONLY ❑ PASSENGER SIDE ONLY	
SUBSTRATE CLEANED AND PREPARED ACCORDING TO 3M RECOMMENDATIONS: ❑ YES (DATE: _____ BY: _____)	
FILM & GRAPHIC PROTECTION USED	
SIGNATURES OF ALL PARTIES	
INSTALLER	/ DATE
AGENCY REPRESENTATIVE	/ DATE
AUTOMOBILE OWNER/OPERATOR	/ DATE

Instruction Bulletin 5.36 (Auto Inspection Form) - 12

3M Bus & Mini-Bus
Graphics Pre-installation Inspection Record

Page 1 of 2

Installer Requirements

Note: Complete both pages of this Pre-installation Inspection Record, using a separate record for each vehicle, before each new graphic installation and between subsequent graphic installations on the same vehicle.

1. Carefully and thoroughly examine each vehicle and record all potential problem areas prior to installing the graphics. We recommend washing the vehicle so that potential problem areas are easily seen.
2. Ensure that the paint is sound so that graphics will have good adhesion to the paint. For the purpose of this program, "sound paint" is defined as paint that is free of defects (see the "Defects" bullet below).

   Circle all areas on the following diagram where your inspection shows that the paint may be unsound, the graphic may adhere poorly, or graphic removal may damage the vehicle paint. This includes:

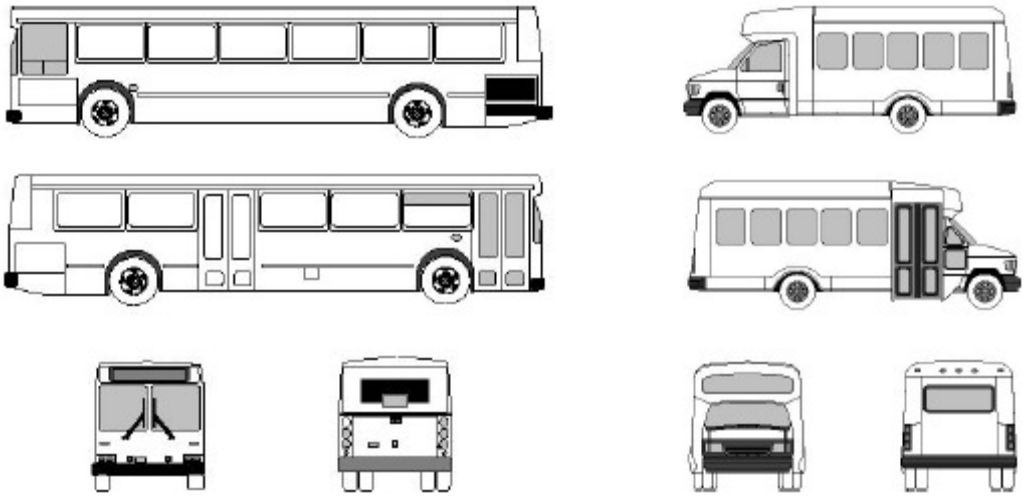
   - Defects: loose paint, dents, rough surface, fillers used for damage, rust or blistered paint.
   - Areas where water can collect, which are more likely to rust, resulting in paint adhesion problems.

Note: Primer, which does not outgas, may be applied to bad paint spots on the vehicle to prepare it for another graphic wrap. However, this must still be considered a problem area and must be documented on the Pre-installation Inspection Record.

3. Photograph all areas that you circled on the diagram as exhibiting unsound paint.
4. Explain proper graphic maintenance to the Vehicle Owner/Operator. See Instruction Bulletin 6.5.
5. Complete the Pre-installation Inspection Record (see the next page of this document).
6. Make and distribute copies to all signing parties.
7. Maintain a file with the signed form and photographs.

Warranty Claims and Exceptions

1. Failure to obtain a properly executed and signed Pre-installation Inspection Record (see the next page of this document) prior to graphic installation voids all expressed or implied 3M product warranties.
2. If the pre-inspection shows the paint is not free of defects, the owner of the vehicle waves all expressed or implied 3M product warranties.
3. 3M makes no warranty (expressed or implied) for paint or existing graphic damage that occurs during the removal of a graphic (including, but not limited to, vehicle paint staining or image ghosting that may be visible after removing a graphic). See the 3M™ MCS™ Warranty for complete details at www.3Mgraphics.com.
4. To make a claim, contact 3M Commercial Graphics Quality Direct at 1-800-511-3705 or go to www.3Mgraphics.com/qualitydirect. Be prepared to send in:
   - A piece of the 3M film exhibiting the defect.
   - A properly executed and signed 3M Pre-installation Inspection Record, including any available photographs.



Circle all areas where the paint may be unsound. Mark only one vehicle type.
(Diagrams courtesy of Digital Auto Library, 1-888-843-1325 or www.digitalauto.on.ca)

Instruction Bulletin 5.36 (Bus Inspection Form) - 13

3M Bus & Mini-Bus
Graphics Pre-installation Inspection Record

Page 2 of 2

COMPLETE THIS FORM, PROVIDE A COPY FOR EACH SIGNER AND RETAIN WITH PHOTOGRAPHS IN CASE OF A CLAIM.

Please print except in signature boxes.

BUS OWNER/OPERATOR
COMPANY NAME
CONTACT NAME
STREET ADDRESS
CITY / STATE / ZIP
AREA CODE / PHONE NUMBER
GRAPHICS PRINTER
COMPANY NAME
CONTACT NAME
STREET ADDRESS
CITY / STATE / ZIP
AREA CODE / PHONE NUMBER
GRAPHICS INSTALLER
COMPANY NAME
CONTACT NAME
STREET ADDRESS
CITY / STATE / ZIP
AREA CODE / PHONE NUMBER

BUS INFORMATION
LICENSE NUMBER
BUS YEAR, MAKE AND MODEL
VIN NUMBER
BUS OWNER/OPERATOR
PRE-INSPECTION: (see the previous page of this bulletin for inspection requirements) ❑ PASSED (DATE: _____ BY: _____) ❑ FAILED (Owner waives all product warranties if graphics are applied)
PHOTOGRAPHS OF POTENTIAL PROBLEM AREAS: ❑ YES (DATE: _____ BY: _____) ❑ NO
GRAPHIC CONSTRUCTION AND INSTALLATION INFORMATION
INSTALLATION DATE
GRAPHIC COVERAGE ❑ FULL ❑ BODY ONLY ❑ WINDOWS ONLY ❑ QUEEN PANELS ONLY ❑ KING PANELS ONLY
SUBSTRATE CLEANED AND PREPARED ACCORDING TO 3M RECOMMENDATIONS: ❑ YES (DATE: _____ BY: _____)
FILMS/OVERLAMINATES USED
SIGNATURES OF ALL PARTIES
INSTALLER / DATE
AGENCY REPRESENTATIVE / DATE
BUS OWNER/OPERATOR / DATE

Instruction Bulletin 5.36 (Bus Inspection Form) - 14

FAQ Vehicle Care
Release A, Effective January 2011

Caring for Your Vehicle Graphics

Care for your vehicle graphics like you would any fine paint finish.
Using high quality products designed specifically for car care and these cleaning and maintenance procedures will help keep your 3M vehicle graphics looking their best.

1. Wash regularly

- Wash whenever the car appears dirty. Contaminants allowed to remain on the graphic may be more difficult to remove during cleaning.
- Rinse off as much dirt and grit as possible with a spray of water.
- See item 4, Difficult contaminants, for spot cleaning bird droppings, tar, etc.
- Use a wet, non-abrasive detergent such as 3M™ Car Wash Soap 39000 or Meguiar's NXT Generation® Car Wash or Deep Crystal® Car Wash and a soft, clean cloth or sponge.
- Rinse thoroughly with clean water. To reduce water spotting, immediately use a silicone squeegee to remove water and finish with a clean microfiber cloth.

2. Automated car washes

Brush-type car washes are not recommended as they can abrade the film and cause edges to lift or chip, as well as dulling the film's appearance. Brushless car washes are acceptable.

3. Pressure washing

Although hand washing is the preferred cleaning method, pressure washing may be used under these conditions.

- Ensure the water pressure is kept below 2000 psi (14 MPa).
- Keep water temperature below 80°C (180°F).
- Use a spray nozzle with a 40 degree wide angle spray pattern.
- Keep the nozzle at least 1 foot (300 mm) away from and perpendicular (at 90 degrees) to the graphic.

Important Note!

Holding the nozzle of a pressure washer at an angle to the graphic may lift the edges of the film.

4. Difficult contaminants

Soften difficult contaminants such as bug splatter, bird droppings, tree sap and similar contaminants by soaking them for several minutes with very hot, soapy water. Rinse thoroughly and dry. If further cleaning is needed, test one of these products in an inconspicuous area to ensure no damage to the graphics: Meguiar's Gold Class™ Bug and Tar Remover or 3M™ Citrus Base Cleaner. Isopropyl alcohol (IPA) (two parts IPA to 1 part water) or denatured alcohol may also help. Spot clean the contaminants. Do not use rough scrubbing or abrasive tools, which will scratch the film. Wash and rinse off all residue immediately.

5. Fuel spills

Wipe off immediately to avoid degrading the vinyl and adhesive. Then wash, rinse and dry as in Item 1 as soon as possible.

6. Polish and wax

Most standard graphic films and overlaminates can be polished or waxed with a high quality car wax. Before use, test and approve in an inconspicuous area. Do not use any abrasive polishes or cutting compounds.

For the carbon fiber and brushed metal films in Scotchprint® Wrap Film Series 1080, a polishing product such as 3M™ Tire Restorer or Meguiars® Natural Shine Protectant may be used. We do not recommend any polishing or wax product for the matte or textured films.

7. Store indoors or under cover whenever possible

Vinyl graphics (just like paint) are degraded by prolonged exposure to sun and atmospheric pollutants, particularly on the horizontal surfaces such as hood, trunk lid and roof. Whenever possible, store in a garage or at least in a shaded area during the day. At night protect the car from dew or rain, which may contain acidic pollutants (a common problem in many large metropolitan areas). When a garage is not available, consider using a cloth car cover at night. If your graphics start to discolor or turn brown (which is caused by acidic pollution), immediately remove the graphics from the vehicle to avoid staining the underlying paint.

8. Visit us on the web!

For complete information about 3M products and warranties, please go to: www.3Mgraphics.com.

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3M

Instruction Bulletin 6.5
Release H, Effective October 2010 *(Replaces G, Jan 09)*
See Bulletin Change Summary and end of Bulletin

Storage, Handling, Maintenance and Removal of Films and Sheetings

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3M Vinyl Storage, Handling, Maintenance & Removal – (continued)

2. Overview

This bulletin gives you basic procedures for storing, handling, maintaining, and removing films manufactured or sold by 3M Commercial Graphics Division. These procedures help maximize the life of the graphic. Refer also to the Product Bulletins for each product in your graphic construction for specific details that may influence the information in this Bulletin.

DO NOT use these procedures for 3M™ Panaflex™ Awning and Sign Facings. Refer instead to Instruction Bulletin 6.1.

3. Definitions

A. Substrate — The material to which a graphic is applied, such as painted metal or wallboard.

B. Surface — The typography or physical characteristics of the substrate, such as flat, textured or corrugated.

C. Film — Refers to both film and sheeting.

4. Health and Safety

This information is applicable to many of the procedures in this Bulletin. Please read and follow them.

⚠ CAUTION

When handling any chemical products, read the manufacturers' container labels and the Material Safety Data Sheets (MSDS) for important health, safety and environmental information. To obtain MSDS sheets for 3M products go to 3M.com/MSDS, or by mail or in case of an emergency, call 1-800-364-3577 or 1-651-737-6501.

When using any equipment, always follow the manufacturers' instructions for safe operation.

⚠ CAUTION

Any activity performed for a long period of time in an awkward position or with a high amount of force is potentially a risk for causing musculoskeletal strain, pain or injury. When applying graphics, follow these practices to improve comfort and avoid injury:

- Alternative your tasks during the application.
- Schedule regular breaks.
- Perform stretches or do exercises to improve circulation.
- Avoid awkward reaching.

A. Air Quality Regulations

State Volatile Organic Compound (VOC) regulations may prohibit the use of certain cleaning chemicals with VOC's in graphic arts coatings and printing operations. For example, the California South Coast Air Quality Management District prohibits use of certain solvent-based solutions without a permit and other California AQMD's prohibit use of certain solutions without a permit or a regulatory exemption. Check with your State environmental authorities to determine whether use of this solution may be restricted or prohibited.

5. Storage

These values are typical. Refer to your film's Product Bulletin for specific information.

A. Unapplied Graphics

- Clean dry area.
- Away from direct sunlight, excessive atmospheric moisture or humidity.
- Ambient temperatures less than 100°F (38°C) and a relative humidity less than 80%.
- Apply graphics to a substrate within the time period specified in the Product Bulletin of the product(s) you are using.

B. Rolls

- Store horizontally in the shipping carton, with the end caps in place, and covered with the original plastic
- Rolls that have been removed from the carton can be suspended horizontally from a rod or pipe placed through the core.

C. Cut Sheets

- Store cut sheets lying flat.
- Do not stack cut sheets face-to-face.
- Do not apply pressure to stacks of cut sheets.
- Wrap stacks of cut sheets with polyethylene film and seal with tape to prevent moisture absorption by the liner, which can cause the sheets to curl or ripple.

3M Vinyl Storage, Handling, Maintenance & Removal – (continued)

D. Fabricated Sheets: Most Screen Printed or Electrostatically Printed

Note: Refer to your base film's Product Bulletin to check for any unique details.

- Store and ship sheets lying flat or rolled onto a core.
  - For rolling screen printed graphics, use a core with a diameter of 5 inch (125 mm).
  - For rolling electronically imaged graphics, use a core with a diameter of 6 inch (150 mm) or larger.
  - Wrap the graphic onto the core, graphics-side out. This helps prevent graphics or premask tape from popping off the liner.
- Do not stack cut sheets face-to-face.
- The final color and/or overprint clear must be completely dry before packaging.
- When slip-sheeting is necessary, use 3M™ Easy Release Liner Paper SCW-33 with the shiny side facing the printed graphic. Slip sheeting between graphics is not necessary unless:
  - The protective liner has been printed by the customer.
  - The film has a heat-activated adhesive.

E. Scotchlite Films 680CR or IJ680CR (all variations)

When 3M™ Scotchlite™ Reflective Graphic Films 680CR or IJ680CR are used for cut graphics and 3M™ Prespacing Tape SCPS-55 is applied, store and ship graphics lying flat, only.

F. Applied Graphics: On Panels, Sheet Metal, Plastic Sheet, etc.

- Protect each layer with 3M™ Easy Release Liner SCW-33 so the shiny side faces the printed graphic.
- If the substrate has been printed or decorated on two sides, protect each side with the liner paper.
- Large graphics should also be padded to reduce the risk of damage.
- Store applied panels on edge.
- Avoid banding, crating or stacking, and corrugated cardboard dividers, all of which put severe pressure on applied graphics.
- Store indoors and keep dry until ready to use. If the packaged graphics become wet, remove the slip sheeting and padding immediately, lay the graphics flat, and allow to dry. Repackage using new, dry materials.

6. Handling

Applied graphics must be handled carefully during shipment and installation to prevent damage to the face of the graphic.

A. Remove Premask Tape Before Exposing Graphic to Sunlight

Always remove any premask or application tape from the graphic immediately after application. Premask tape left on the graphic after application can quickly and permanently adhere to the graphic when exposed to sunlight.

B. Temporarily Covering Installed Graphics

If it is necessary to temporarily cover installed graphics, which is sometimes called "bagging", use caution to avoid damaging the graphics.

- You may use:
  - Porous cloth covers that are folded over the graphic edges and secured to the back of the graphic work well for one-sided graphics.
  - If porous cloth covers are used for two-sided graphics, secure the cloths to one another, not to the graphic.
  - Any 3M graphic film that includes the word "changeable" in its product name may be temporarily applied over other 3M brand permanent films that have a higher adhesion to the substrate than the bagging film has to the permanent film.

Note: DO NOT bag any graphic applied to 3M™ Panaflex™ Awning and Sign Facing.

- Avoid using:
  - Any type of tape, which can quickly and permanently bond to the graphic.
  - Paper or plastic covers, due to possible plasticizer migration.
  - Ropes or wire fasteners, which may abrade the graphic.

3M Vinyl Storage, Handling, Maintenance & Removal – (continued)

7. Maintenance

A. Graphics with a Screen Print Clear or Overlaminate

Use a cleaner designed for high-quality painted surfaces. The cleaner must be wet, non-abrasive, without strong solvents, and have a pH value between 3 and 11 (neither strongly acidic nor strongly alkaline.)

B. Digitally-Printed Graphics with a Clear Coat

Use a wet, non-abrasive solution that contains NO solvents and NO alcohol and has a pH value between 3 and 11 (neither strongly acidic nor strongly alkaline.)

C. Power Washing Graphics

Power washing, or pressure washing, may be used. However, aggressive washing can damage the graphic.

Excessive pressure during power washing can damage the graphic by forcing water underneath the graphic. Water lessens the adhesion of the graphic to the substrate allowing the graphic to lift or curl. These problems are magnified by wind. This is a critical problem for perforated window graphic film.

To avoid edge lifting or other damage to the graphics, follow these important steps:

- Use a spray nozzle with a 40 degree wide spray pattern.
- Be sure the spray nozzle includes a nozzle protector (tip guard).
- Use a maximum pressure of 1500 to 2000 psi.
- If the system is heated, limit the water temperature to 180°F (82°C) or less.
- Hold nozzle at least 12 inches (300 mm) away from and perpendicular (90 degrees +/- 10) to the graphic.
- Do not direct the water stream at a sharp angle to the edge of the graphic.

⚠ CAUTION

Loose graphics could tear away from a moving vehicle or from a building and cause an obstruction to motorists and pedestrians. After washing, check all the graphics carefully for edge lifting and repair, remove or replace damaged graphics.

⚠ CAUTION

To reduce the risk of serious injury from high pressure spray:

- Do not place your hand or body near the nozzle or the spray.
- Do not direct the spray toward anyone else.

D. Automatic Brush Washing

Automatic brush washing may be used, but keep these two points in mind:

- Brushes can catch a loose edge of the graphic and cause further damage to the graphic.
- Brushes can dull the finish of the graphic.

E. Hand Washing Exterior Graphics

1. Rush the graphic with clean water to remove loose dirt particles. A trigger-type hose nozzle is convenient for this purpose.
2. Use a mild liquid detergent and water solution and wash the graphic with a soft brush, rag or sponge
   - Wash thoroughly from the top down.
   - Avoid abrading the graphic by unnecessary scrubbing.
   - After applying the cleaning solution, keep a steady stream of water flowing on the graphic to wash away dirt particles.
3. Rinse the entire graphic thoroughly with clean water. Allow to dry naturally.

F. Hand Washing Interior Graphics

1. Use a mild liquid detergent and water solution and wash the graphic with a soft brush, rag, or sponge.
   - Wash thoroughly from the top down.
   - Avoid abrading the graphic by unnecessary scrubbing.
2. Wipe the graphic with a water-soaked brush, rag or sponge to wash away the detergent and dirt.

Continued on the next page.

3. Dry the graphic with clean toweling.
4. Refer to Removing Difficult Contaminants, above, if necessary.

G. Caring for Matte, Textured or Other Unique Film Finishes

Special care must be taken to avoid abrading or scratching the film. Scratching and abrasion marks may be visible and you may not be able to work them out of the unique finish of the film. To help avoid such damage, avoid using harsh chemicals, brushes or hard scrubbing when cleaning your vehicle, and avoid parking near shrubs and trees or any other items that could scratch the film.

Clean as directed in Step 7.A., above. Rinse thoroughly after cleaning and dry with a clean, soft cloth or soft rubber squeegee to avoid water spots.

Do not apply waxes, polishes, paint or clear coat over these films.

If there is wax and wax residue on the film, remove with an all-purpose cleaner. To help restore the finish of the film, clean it with isopropyl alcohol and water (2:1 ratio).

H. Removing Difficult Contaminants

Some contaminants may remain after following the normal cleaning procedures. Most contaminants can be removed using one of these methods. Other cleaning products and methods should be used only on a customer test-and-approve basis.

1. To remove tar, oil, diesel smut or bituminous material:
   - Wipe with 3M™ Citrus Base Cleaner or a rag dampened with kerosene, mineral spirits, heptane, or VM&P naphtha. Do not use other solvents.
2. To remove pollen and fungus:
   - Wash the graphic with a 3 to 5% sodium hypochlorite (full-strength household bleach) solution or mild liquid detergent and water.
   - Rinse with clean water immediately.
3. To remove crayon, lipstick, or similar materials:
   - Select an appropriate solvent and test it in an inconspicuous area to ensure it removes the contaminant without damaging the graphic. This must be done on a customer test and approve basis.
   - Wash immediately with mild liquid detergent and water, then rinse with clean water.

I. Graphic Repair

Sometimes graphic damage can be repaired; however, **repaired graphics are not warranted.** These procedures are for information only.

(1) Damage to Face of Graphic

1. Trim and clean loose areas of film before patching.
2. Use a film with pressure-sensitive adhesive, if possible. The color or gloss of the new film will vary slightly due to weathering of the original material.
3. Cut the patches so they overlap all sides of the damaged area by at least 1/4 inch (6.4 mm).
4. Position the patch over the damaged area.
5. Hold the patch in place at the top with a strip of Scotch™ Masking Tape.
6. Remove the film's liner.
7. Squeegee the film firmly into place using a plastic applicator.
8. Use a heat gun to heat all edges of the patch, and then re-squeegee all edges.

(2) Edge Damage

1. Trim loose edges back to the point where the adhesive is firmly adhered to the substrate.
2. Apply edge sealing, if desired. Edge sealant may help prevent further damage if the lifting is caused by aggressive washing conditions. Refer to the film Product Bulletin for the appropriate edge sealer.

3M Vinyl Storage, Handling, Maintenance & Removal – (continued)

8. Removal Factors

The terms changeable, removable and permanent simply indicate how easy or difficult it is to remove the film from smooth, flat surfaces, and how much adhesive remains on the substrate. These terms do not refer to adhesive strength. In fact, there are removable products, such as 3M™ Controltac™ Graphic Film Series 180, that have high adhesive strength and long-term durability, yet have other characteristics that make it relatively easy to remove the film.

For the best results, changeable and removable films should be removed within the time period specified in the film's Product Bulletin. Permanent films can be removed with varying degrees of difficulty and success at almost any time. Results will vary when removing any graphic from non-flat, non-smooth surfaces.

Warranted removal rates for fleet applications as part of the 3M™ MCS™ Warranty depend upon: (A) substrates that were in good condition at the time of the application, (B) use of 3M's recommended removal methods: and, (C) notification to 3M no later than five business days after the attempted removal so that 3M may assist in or verify the removal method.

The ease with which a graphic can be removed depends on nine primary factors, listed below. Any one of these factors can significantly affect the speed and ease of removal. Different combinations of factors cause different results. For example, if one of two identical graphics is exposed to more UV light than the other (Factor H., page 7) over the same period of time, the graphic exposed to the most UV light may be more difficult to remove.

It is important to understand and assess each of these factors before estimating the time, labor and related costs for removal.

A. Properties of the Film

3M offers a variety of films to meet various end uses. Generally, these materials can be categorized into four physical types and three adhesive types.

(1) Physical Types

- 2 mil plastic
- 4 mil plastic
- Reflective film
- Urethane

Note: Thicker changeable or removable plastic films and films with an overlaminate are the easiest to remove since they will not break and tear under most conditions.

(2) Adhesive Types

There are three categories of adhesive: changeable, removable and permanent. The descriptions assume the film is applied to a recommended and properly prepared sound substrate with a smooth surface. Any other substrate may give other results. Whether a film is removable is largely, but not exclusively, a function of the adhesive.

- Changeable films can be removed without any aids such as heat or chemicals and without leaving adhesive residue.
- Some removable films can be removed with the aid of heat only. Others may require chemicals or accessories. These films leave less than 30% adhesive residue.
- Permanent films are not designed to be removed. In some cases they can be removed, but with great difficulty and likely damage to the substrate. If they are removed, they may leave significant adhesive residue.

B. Type of Substrate and Surface

- The type of substrate and surface to which a particular film is applied can affect both the initial adhesion and ultimate adhesion.
- Graphics applied to a flat surface are the easiest to remove. Surfaces with rivets are more difficult, and corrugated surfaces are usually even more difficult.
- Some substrates are not designed to have graphics removed and removal may damage the substrate. These substrates include unpainted wallboard and some flexible materials.
- Removal is not warranted from substrates that have coatings such as anti-reflection and scratch resistance, which may be damaged by film removal.

C. Temperature

Film becomes brittle in cold weather, causing it to break into small pieces during removal. For the best results, remove film when the temperature is above 40°F (10°C). Generally, the higher the temperature, the better the results. Applying heat will help with most removals, but use care not to damage the substrate with excessive heat.

3M Vinyl Storage, Handling, Maintenance & Removal – (continued)

D. Condition of the Substrate at Application

Removing graphics from substrates that were not in good condition at the time of application may result in substrate damage. We recommend discussing any concerns with your customer if you suspect that damage will result.

- Slightly oxidized (not chalked), painted substrates actually develop a much higher adhesion than newly painted substrates. Such substrates have a texture similar to anodized, bare aluminum, which promotes higher adhesion. Graphic removal may require more effort and is not covered by the fleet applications removal rate warranty.
- However, highly oxidized substrates, such as chalked paint, have poor adhesion and graphics may remove more easily.
- Painted substrates must be dried or cured per the paint manufacturer's recommendations. Graphics that were applied to freshly painted substrates, before the paint had sufficient time to cure, make removal difficult. This is not covered by the application's removal rate warranty. Substrate damage may also occur.

E. Type and Amount of Ink

The type and amount of ink used affects the elongation and tear characteristics of printed film. UV-cured inks tend to be harder and more durable than solvent inks. Thicker and/or more durable inks stretch less so that graphics tear more easily during removal.

F. Type of Overlaminate or Clear

Adding an overlaminate or clear (an ink) further affects the elongation and tear characteristics of a graphic. An overlaminated film is thicker and may be easier to remove.

G. Age of the Graphic

Older graphics become brittle and their adhesion to the substrate increases with time. Both of these conditions make removal more difficult.

H. Outdoor Exposure

Exposure to higher temperatures and UV light (sunlight) affects removal. Prolonged exposure to these elements can make the film brittle, changing its tensile strength. This film may tear and break easily, making removal very slow and tedious.

I. Cut, Torn and Damaged Film

Film tears along any cuts or damage so it tends to pull off in small pieces rather than large ones. This makes removal very slow and tedious.

9. Removal Methods for Removable or Changeable Films

Before starting to remove a graphic, read About Angle of Pull-off **and** Speed of Removal and About Using Heat Sources. These sections apply to all removal methods.

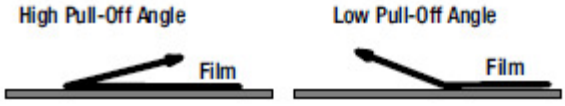
If you do not know the characteristics and history of the graphic, try the simplest removal techniques first. The techniques are listed in order from easiest (1) to most difficult (4), starting on page 8.

A. About Angle of Pull-off and Speed of Removal

The angle at which you pull off film is important. It depends on the film and may affect the amount of adhesive residue that remains on the substrate. Changeable and removable films usually require a high angle, such as pulling the film back onto itself, such as for 3M™ Controltac™ Graphic Film 180, IJ3552C, IJ180Cv3 or 8620C. A low angle is recommend for 3M™ Scotchcal™ Perforated Window Graphic Films and removable 3M™ Scotchlite™ Reflective Films and Sheetings. Sometimes the pull-off angle affects the amount of adhesive residue. Experiment with the angle until you get the best removal results. See FIGURE 1.

The speed, or rate, at which you pull off the graphic can affect how much adhesive residue remains on the substrate. Some films can be pulled off quickly, or "snapped" off. Brittle films can sometimes be peeled off slowly.

FIGURE 1
Angle of Pull-Off



3M Vinyl Storage, Handling, Maintenance & Removal – (continued)

B. About Using Heat Sources

⚠ CAUTION

Heat or open flames may contribute to a flash fire or burns. Follow these precautions when using a heat source for flame treating.

- Read and follow the instructions supplied with the heat source.
- Avoid personal contact with the heat source. Wear heat-resistant gloves and safety glasses.
- Do not use heat sources near solvent mixtures or residues, or where solvent vapors may be present.

⚠ CAUTION

Always provide adequate ventilation to remove emissions that may result from the use of heat. Failure to provide adequate ventilation can result in operator exposure.

Heating a graphic eases removal of almost any film, even films that can typically be removed without aids. Heat softens the adhesive, reducing the pull-off force needed. However, film printed with some UV inks become brittle when using heat unless moisture is also used.

The applicator/remover must determine the appropriate tools, techniques and safety precautions for each situation. For most situations, use a heat source that can raise the applied graphic temperature to 160° to 200°F (72° to 93°C) can be used. Exposure to the sun may be sufficient. Other sources include heat lamps, hot water, industrial heat guns, steamers, hand torches and weed burners.

Each tool has limitations. Heat sources that develop higher BTU can heat larger areas more quickly, but are less safe to use. They also may oxidize or burn painted areas around the graphic, and may emphasize any shadow that remains where the graphic was applied.

Use care not to scorch, burn or otherwise damage the film or substrate when using heat.

(1) Heat Sources on Window Graphics

Certain substrates require lower heat. They are:

- For DuPont Lucite® SAR and GE Plastics Lexan® MRG windows, heat the substrate only to 70° to 100°F (21° to 38°C).
- For glass, heat is not required if the glass window panels are warmer than 60°F (16°C).

(2) Glass Breakage

Important Note!

3M is not responsible for glass breakage due to the application or removal of film, or damage caused to a substrate due to incorrect removal techniques.

C. Unaided Film Removal

Changeable films can be removed without any aids within the time period specified in the film's Product Bulletin.

1. Use a razor, knife or air release tool to lift up a corner of the graphic.
2. Pull the graphic from the substrate. Changeable films usually require a high pull-off angle.
3. If the removal is done in cooler temperatures, heating the graphic and/or cutting it into 12 to 15 inch (300 to 380 mm) wide strips makes removal even easier. Be careful not to damage the substrate.

D. Heat-aided Film Removal

Removable films usually come off with just the aid of heat within the time period specified in the film's Product Bulletin.

Note: Some substrates are heat sensitive. Composites bonded together with foam or adhesive may separate when heat is applied. Before using heat, check to make sure that heat will not damage the substrate.

1. Review the section, *About Using Heat Sources*, page 8.
2. Use a razor, knife or air release tool to lift up a corner of the graphic.

Continued on the next page.

3. Pull the graphic from the substrate. Removable films usually require a low pull-off angle. Some films can be "snapped" off in sections.
4. Score the graphic into 12 to 15 inch (300 to 380 mm) wide strips to make removal easier. Be careful not to damage the substrate.

E. Chemically-aided Film Removal

Chemical aids may be needed for removable films if the film cannot be removed with heat alone. This may occur when the graphic has been exposed to excessive environmental conditions or has remained on the substrate longer than intended.

There are several chemical methods available, many of which require special precautions to use in a safe, environmentally-responsible manner. The user must obtain, read, and follow the MSDS sheet for any chemical used.

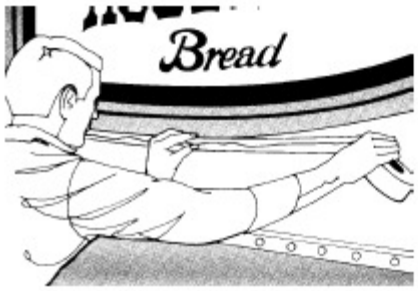
Some chemicals may damage the substrate or its finish. Always test the chemical in a small, inconspicuous area, allowing the chemical to remain on the graphic for the recommended length of time. Remove the film and check for substrate damage.

(1) 3M™ Woodgrain & Stripe Remover System Part No. 08907 and 08908

This remover system may be used on all 3M removable graphic films, except 3M™ Controltac™ Graphic Films with or without Comply™ Adhesive, including 180, 180C, IJ180Cv3, IJ180, IJ180C, IJ180Cv3, IJ380Cv3, 8620, 8620C and 8620Cv3. See page 10 for the recommended system for these films. 3M woodgrain and stripe remover system may not be as effective on graphics printed with UV inks.

1. Follow the manufacturer's safe handling instructions, including wearing appropriate protective equipment such as rubber gloves and safety goggles.
2. Mask around the graphic. This helps protect the substrate from damage.
3. Make a drip tray using wide masking tape that has been doubled over and adhered immediately below the graphic. This prevents residue from dripping around the graphic. See FIGURE 2, below.

FIGURE 2
Making a Drip Tray



4. Spray the graphic lightly with the remover.
5. Cover the graphic with an absorbent material such as paper toweling.
6. Spray the remover onto the toweling until it is thoroughly wetted.
7. Cover the saturated toweling with polyethylene sheeting to retard evaporation, especially if it is warm or windy.
8. Allow the saturated toweling to remain in place for 3 to 4 minutes.
9. Carefully remove the toweling; most of the graphic will be removed with the paper.
10. Spray the remover on the adhesive residue.
11. Allow the remover to work for 3 to 5 minutes.
12. Scrape off the residue with a plastic applicator, cleaning of the tool regularly with toweling.
13. Continue applying the remover to the adhesive, waiting, and scraping, as needed.
14. Remove the masking tape.
15. Rinse the area thoroughly with clean water and dry.

3M Vinyl Storage, Handling, Maintenance & Removal – (continued)

(2) 3M™ Controltac™ Film Remover R-221 and Adhesive Remover R-231

This remover system is designed specifically for removing 3M™ Controltac™ Graphic Films with or without Comply™ Adhesive that is unprinted or printed with solvent ink. This includes all variations of films 180, 180C, IJ180, IJ180C, 8620 and 8620C. It is not effective on graphics printed with UV inks.

1. Follow the manufacturer's safe handling instructions, including wearing appropriate protective equipment such as rubber gloves and safety goggles.
2. Clean the graphic surface with mild detergent and water. Dry thoroughly.
3. Mask around the graphic. This helps protect the substrate from damage.
4. Make a drip tray using wide masking tape that has been doubled over and adhered directly below the graphic. This prevents residue from dripping around the graphic. See RGURE 2.
5. Thoroughly coat the graphic with film remover R-221, using a paint brush or roller. The coverage rate should be 150 square feet per gallon.
6. Allow to dry for at least 15 minutes at room temperature or warmer. Leave it on for a longer time in cooler temperatures.
7. Test removability by grasping a corner of the graphic and pulling it from the surface at a low angle--less than 90 degrees. The film should come off with low to moderate force. It should stretch and remove easily.
   - If the film is still too brittle, apply a second coat, let dry, and repeat the removal test.
   - If the film removes easily, continue with Step 7.
8. Remove the masking tape but leave the drip tray in place.
9. Spray adhesive remover R-231 onto areas where there is adhesive residue.
10. Allow the liquid to penetrate for 30 to 60 seconds.
11. Remove the adhesive by scraping with a plastic applicator or rivet brush. Wipe the loosened residue with a cloth saturated with adhesive remover. Repeat this procedure as needed.
12. Remove the drip tray.
13. Clean the entire surface with a solvent wipe and follow with a mild detergent and water wash.
14. Dry the surface.

F. Mechanically-aided Film Removal

Note: Damage to the substrate caused by mechanical removal of graphics is not covered by the 3M™ MCS™ Warranty.

Most mechanical removal techniques result in substrate damage. Tools such as scrapers, abrasive wheels and particle blasting devices are difficult to control in a way that removes only the graphic. You may want to consider using these tools if the substrate will be repainted or refinished after graphic removal.

The following recommended tools are not suitable for graphics covering large areas. They work best on removing stripes, small letters or graphics or the outside edges from large graphics.

(1) 3M™ Stripe Off Wheel

The Stripe Off Wheel has a solid 5/8 inch thick wheel and is the best tool for removing the edges of a graphic. It does not scratch or damage acrylic enamel or urethane paint. It is designed to be used with common 3/8 inch pneumatic and electric tools with a 500 to 4,000 RPM speed range. The optimum performance is 2000 +/- 200 RPM.

The Stripe Off Wheel is sold by 3M Automotive Aftermarket Products and Systems Division and is listed in their catalog.

- Part number 051131-07498: Stripe Off Wheel and 3/8 inch mandrel (5 per package)
- Part number 011131-07499: Stripe Off Wheel without the attachment hardware (5 per package)

3M Vinyl Storage, Handling, Maintenance & Removal – (continued)

(2) 3M™ Scotch-Brite™ Large Area Stripe Removal (LASR) Disc Assembly

The LASR disc has stacked, solid wafer construction, 8 inch x 5/8 inch. It is designed to be used with the Black and Decker Buffmaster #6138, a variable speed buffer with a 1500-3000 RPM speed range. It has a larger contact area than the Stripe Off Wheel, so removal may take less time. This tool does not scratch or damage acrylic enamel or urethane paint. Systems Division and it is listed in their catalog.

The LASR disc is sold by 3M Automotive Aftermarket Products and Systems Division and is listed in their catalog.

- Part number 051131-07517: LASR disc assembly for 5/8-11 shaft
- Part number 011131-07519: adapter for attaching a LASR disk assembly to a 5/8-11 external shaft

10. Removing Adhesive Residue from the Substrate

Some adhesive residue may be left on the substrate after removing the film. Always read and follow the MSDS sheet for the products you use.

A. Products Used In Residue Removal

- 3M™ Citrus Based Industrial Cleaner
- 3M™ Woodgrain and Stripe Adhesive Remover 08908
- 3M™ General Purpose Adhesive Cleaner 08984 (several sizes are available)
- 3M™ Adhesive Remover R-231 for Controltac™ Film
- Xylol (xylene)

B. General Residue Removal Steps

These steps may vary depending on the product you are using.

1. Read the manufacturer's instructions for the adhesive remover product. Use the product only as directed and only in a well-ventilated area.
2. Follow the manufacturer's safe handling instructions, including wearing appropriate protective equipment such as rubber gloves and safety goggles.
3. Test the remover by applying in an inconspicuous area to make certain that it does not damage the substrate.
4. Apply the remover as directed and allow the prescribed time for the chemical to penetrate the adhesive.
5. Remove the softened adhesive by scraping with a plastic applicator or rivet brush.
6. Pick up the loosened adhesive with a cloth saturated with the adhesive remover.
7. Repeat steps 4 through 6 as needed.
8. After the residue is removed, clean the entire surface with a solvent wipe and then wipe dry with clean toweling before the solvent evaporates.
9. Wash the entire substrate with a solution of detergent and water.
10. If you are applying a new graphic, dry the substrate thoroughly with a clean, lint-free towel.

11. Disposing of Removed Graphic Material

⚠ CAUTION

Adhesive or film removers, and solvent wipes or film wetted with the removers, should be incinerated in a permitted hazardous waste incinerator. Since regulations vary, consult the applicable regulations or authorities before disposal.

3M Vinyl Storage, Handling, Maintenance & Removal – (continued)

12. 3M Related Literature

Before starting any job, be sure you have the most current Product and Instruction Bulletins.

The information in 3M Product and Instruction Bulletins is subject to change. Current Bulletins are available at 3Mgraphics.com. The techniques described in these Bulletins are required when applying a 3M warranted graphic, but are also practical recommendations when using promotional materials for non-warranted graphics. Additional Bulletins may be needed as indicated in the 3M Related Literature section of other 3M components you use.

Bulletin types: PB = Product Bulletin; PB-IB = Product & Instruction Bulletin; IB = Instruction Bulletin

Subject	Type	Bulletin No.
Base Films and Substrates Please visit our website to identify and select the additional Product and Instruction Bulletins you need for a successful application.		
Cleaning and Repairing Decorated Awning and Sign Facings	IB	6.1
3M Graphics Center Warranty Brochure	go to www.3Mgraphics.com, Warranties	

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13. Bulletin Change Summary

Added information on the maintenance of matte film graphics in Section 7.G.

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If you have any questions, please contact the Ford Truck Body Builders Advisory Service as shown in the header of this bulletin.